NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

JOINT APPLIED PROJECT

STUDY OF THE LIGHT UTILITY HELICOPTER (LUH) ACQUISITION PROGRAM AS A MODEL FOR DEFENSE ACQUISITION OF NON-DEVELOPMENTAL ITEMS

December 2014

By: Judith Rubinstein

Advisors: E. Cory Yoder
Richard Nalwasky

Approved for public release; distribution is unlimited

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE			*Form Approved OMB No. 0704–0188*
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202–4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704–0188) Washington DC 20503.			
1. AGENCY USE ONLY *(Leave blank)*	**2. REPORT DATE** December 2014	**3. REPORT TYPE AND DATES COVERED** Joint Applied Project	
4. TITLE AND SUBTITLE STUDY OF THE LIGHT UTILITY HELICOPTER (LUH) ACQUISITION PROGRAM AS A MODEL FOR DEFENSE ACQUISITION OF NON-DEVELOPMENTAL ITEMS			**5. FUNDING NUMBERS**
6. AUTHOR(S) Judith Rubinstein			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943–5000			**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			**10. SPONSORING/MONITORING AGENCY REPORT NUMBER**
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB Protocol number ____N/A____.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited			**12b. DISTRIBUTION CODE**

13. ABSTRACT (maximum 200 words)

The UH-72A Light Utility Helicopter (LUH) was acquired for performance of general support tasks (training, medical evacuation, law enforcement, etc.) in permissive (non-combat) environments, to replace Vietnam-era helicopters, and to free up Black Hawk UH-60 helicopters for combat use. This acquisition program is the Army's first major acquisition of commercially available helicopters subsequently modified for military use. Although initial testing and use indicated the need for unforeseen modifications to the helicopters, in most respects, this program was successful.

The successes included expeditious acquisition and fielding, avoidance of excessive costs, and acquisition of helicopters that incorporated the latest available technology (developed at industry, not at government, expense). Additionally, the helicopters could be, and were, readily tailored for diverse uses. Also, they highly satisfied users' requirements. Finally, all deliveries were on-time or ahead of schedule.

These successes occurred largely because the UH-72A was a non-developmental item with mature technology at the time of acquisition. The time and expense that would otherwise have been needed for development and for ramp-up of production were avoided. Additional factors contributing to the success of the program were clear definition of the requirement, avoidance of scope creep, and close cooperation among all stakeholders.

14. SUBJECT TERMS Commercial acquisition; LUH, Light Utility Helicopter			**15. NUMBER OF PAGES** 171
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UU

NSN 7540–01–280–5500

Standard Form 298 (Rev. 2–89)
Prescribed by ANSI Std. 239–18

THIS PAGE INTENTIONALLY LEFT BLANK

Approved for public release; distribution is unlimited

STUDY OF THE LIGHT UTILITY HELICOPTER (LUH) ACQUISITION PROGRAM AS A MODEL FOR DEFENSE ACQUISITION OF NON-DEVELOPMENTAL ITEMS

Judith Rubinstein, Civilian, Department of the Army

Submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN PROGRAM MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
December 2014

Author: Judith Rubinstein

Approved by: E. Cory Yoder

CDR Richard Nalwasky

William R. Gates, Dean
Graduate School of Business and Public Policy

THIS PAGE INTENTIONALLY LEFT BLANK

STUDY OF THE LIGHT UTILITY HELICOPTER (LUH) ACQUISITION PROGRAM AS A MODEL FOR DEFENSE ACQUISITION OF NON-DEVELOPMENTAL ITEMS

ABSTRACT

The UH-72A Light Utility Helicopter (LUH) was acquired for performance of general support tasks (training, medical evacuation, law enforcement, etc.) in permissive (non-combat) environments, to replace Vietnam-era helicopters, and to free up Black Hawk UH-60 helicopters for combat use. This acquisition program is the Army's first major acquisition of commercially available helicopters subsequently modified for military use. Although initial testing and use indicated the need for unforeseen modifications to the helicopters, in most respects, this program was successful.

The successes included expeditious acquisition and fielding, avoidance of excessive costs, and acquisition of helicopters that incorporated the latest available technology (developed at industry, not at government, expense). Additionally, the helicopters could be, and were, readily tailored for diverse uses. Also, they highly satisfied users' requirements. Finally, all deliveries were on-time or ahead of schedule.

These successes occurred largely because the UH-72A was a non-developmental item with mature technology at the time of acquisition. The time and expense that would otherwise have been needed for development and for ramp-up of production were avoided. Additional factors contributing to the success of the program were clear definition of the requirement, avoidance of scope creep, and close cooperation among all stakeholders.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

LIST OF FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF ACRONYMS AND ABBREVIATIONS

ACAT	acquisition category
AKI	aircraft kill indicator
AM	amplitude modulated
AMCOM	U.S. Army Aviation and Missile Command
APUC	average procurement unit cost
ARC	airborne radio communications
AT&L	Acquisition, Technology & Logistics
AWI	AgustaWestland, Incorporated
BFT	blue force tracker
BN	battalion
CLS	contractor logistics support
COTS	commercial-off-the-shelf
CPT	cockpit procedural trainer
CTC	combat training center
CVR	cockpit voice recorder
DCMA	Defense Contract Management Agency
DOD	Department of Defense
DSCA	Defense Security Cooperation Agency
EADS	European Aeronautic Defence and Space Company
EASA	European Aviation Safety Agency
EDM	electronic data manager
EIBF	engine inlet barrier filter
EO	electro-optical
FAA	Federal Aviation Administration
FAR	Federal Acquisition Regulation
FDR	flight data recorder
FLI	first limit indicator
FM	frequency modulated
FMR	full materiel release

FRP	full rate production
ft	foot/feet
FUE	first unit equipped
GAO	Government Accountability Office
GATP	government acceptance test procedures
GPS	global positioning system
HASC	House Armed Services Committee
HOGE	hover out of ground effect
HQDA	Headquarters, Department of the Army
IFR	instrument flight rules
IOTE	initial operational test and evaluation
IR	infrared
KO	contracting officer
kt	knot (nautical mile/hour)
kW	kilowatt
LRIP	low rate initial production
LUH	light utility helicopter
MDA	milestone decision authority
MDAP	major defense acquisition program
MDHI	Maryland Helicopters, Inc.
MEDEVAC	medical evacuation
MEP	mission equipment package
MHz	megahertz (cycles/second)
MILES	multiple integrated laser engagement system
mph	miles per hour
NET	new equipment training
NTC	national training center
OA	operational availability
OC	observer/controller
OCCS	observer controller communication system
OEM	original equipment manufacturer

OH	observation helicopter
ONS	operational needs statement
OPFOR	opposing force
OSD	Office of the Secretary of Defense
PA	pressure altitude
PAUC	program acquisition unit cost
PEO	program executive office(r)
PM	product manager/program manager
PNM	price negotiation memorandum
PSFR	parts support fill rate
RAM	reliability, affordability and maintenance
RFP	request for proposal
S&S	security and support
SAR	Selected Acquisition Report
shp	shaft horsepower
SMODIM	smart onboard data interface module
SOW	statement of work
SSA	source selection authority
SSEB	source selection evaluation board
SSPD	source selection performance demonstration
TEMP	test and evaluation master plan
TESS	tactical engagement simulator system
UH	utility helicopter
UHF	ultrahigh frequency
USD	Undersecretary of Defense
VEMD	vehicle and engine multifunction display
VFR	visual flight rules
VHF	very high frequency
VIP	very important people

THIS PAGE INTENTIONALLY LEFT BLANK

ACKNOWLEDGMENTS

I am very grateful to all the individuals who helped me complete this thesis. I owe special thanks to Cory Yoder. Richard Nalwasky, Norma Reyes, Joy Julian and Susan Hawthorne also contributed to my completion of this project. I would also like to thank Christopher Rindal, whose responses to my interview questions provided me with some of the information that appears herein. Finally, I would like to thank my friends, who encouraged me in completing this project.

THIS PAGE INTENTIONALLY LEFT BLANK

I. INTRODUCTION

This project is a case study of the Army's light utility helicopter (LUH) acquisition program. The purpose of this project is to trace the history of the LUH acquisition program, to determine what the successes and failures of that program were, and to identify the reasons for those successes and failures. The LUH acquisition program was the Army's first major acquisition of commercially available helicopters. As of late 2014, that acquisition program is nearly completed. This case study can thus provide some indication as to the extent to which commercially available military hardware can meet the Army's needs.

In early 2004, the Army decided to replace its Vietnam era UH-1H Iroquois (often referred to as "Huey") and OH-58A/C Kiowa helicopters (Brownlee 2004; "Light Utility Helicopter" (Global Security) 2011). The replacement helicopters were acquired for light general support tasks in permissive, non-hostile, non-combat environments, primarily within the United States ("Light Utility Helicopter (LUH)" (Global Security) 2011). The Army decided to acquire replacement helicopters that were commercially available, non-developmental, and that were already Federal Aviation Administration (FAA) certified ("Light Utility Helicopter (LUH)" (Global Security) 2011). The Army further decided to have price, rather than technical factors, be the most important source selection criterion, thereby allowing for the possibility of award to a contractor offering a lower-priced helicopter of less than ultimate technical superiority (RFP W58RGZ-05-R-0519). These decisions resulted in the award of a contract to EADS[1] North America, in June 2006 for the purchase of 322 UH-145 (originally called EC-145[2]) light utility helicopters (LUHs) ("UH-72A Lakota Light Utility Helicopter (LUH)" (Global Security) 2014). The EC-145 helicopters are civil aircraft. With minor modifications, they were adapted for military use. The militarized version of the EC-145 is the UH-72A helicopter, also known as the Lakota (Nelms 2009). The differences between the UH-145 and the UH-72A will be discussed in paragraph C.2.*c*.(2) of Chapter II.

"The Lakota is the Army's first large-scale effort to adapt commercially available helicopters for military use" (Tiron 2007). In many respects, the Army's acquisition of commercial LUHs has been a success. In some respects, however, the UH-72As have had to be modified in order to adequately meet the Army's needs.

A. PURPOSE

The purpose of this research is to assess the successes and the problems and failures of the LUH acquisition program and to analyze how the lessons learned from the successes and from the problems and failures can be applied to other defense acquisition programs.

B. RESEARCH OBJECTIVES

The objective of this research is to make guidance available to managers of other defense acquisition programs. This guidance concerns procedures and processes to follow, when practicable, and courses of action to avoid, when practicable, particularly with regard to meeting the Department of Defense's (DOD's) needs with commercially available, non-developmental items. Meeting DOD's needs in this fashion could help maximize the probability of success of future acquisition programs, and it could help minimize the occurrence of problems that have plagued many defense acquisition programs, such as cost overruns and production delays.

C. METHODOLOGY

The author studied available literature on the subject, much of it consisting of short articles from such websites as GlobalSecurity.org (http://www.globalsecurity.org/); Airbus Group's (formerly EADS') website, http://www.uh-72a.com/news/archive.asp; Army Knowledge Online (AKO) (https://akologin.us.army.mil/suite/); and various other websites, and articles in such publications as *Rotor & Wing*, *Army Aviation*, and *Army AL&T*. For background information on the problems with DOD acquisition in general, the author studied several Government Accountability Office (GAO) reports. For additional information, the author contacted the LUH acquisition program's Product Manager (PM) and Contracting Officer (KO). In addition, contact was made with a pilot who has extensively flown UH-72As and the helicopters which the UH-72A was purchased to replace.

D. LIMITATIONS OF RESEARCH

The LUH acquisition program avoided many of the problems plaguing other Major Defense Acquisition Programs (MDAPs) because the LUH is a commercial item with mature technology that was already in production at the time of its acquisition. The purposes for which LUHs were acquired are served adequately by such an item. Some of DOD’s requirements cannot be so met and thus cannot benefit from the advantages that acquisition of commercial items affords. For such requirements, the benefits of the LUH program’s acquisition strategy involving use of commercial items are largely inapplicable.

NOTES ON CHAPTER I

1.”EADS” is the acronym for European Aeronautic Defence and Space Co. (“EADS” (Wikipedia) 2014).

2. The UH-145 is a military variant of the EC 145. (“Eurocopter EC-145” (Wikipedia) 2014).

THIS PAGE INTENTIONALLY LEFT BLANK

II. BACKGROUND

A. COMMON PROBLEMS WITH MAJOR DEFENSE ACQUISITIONS AND THE UH-72A ACQUISITION PROGRAM'S MOSTLY SUCCESSFUL AVOIDANCE OF THESE PROBLEMS

Historically, there have been problems common to many MDAPs. Section A of this chapter explains these common problems. It further explains that although the UH-72A acquisition program was not free of problems, that acquisition program had these problems to a much smaller extent than most other MDAPs. It also explains some of the reasons for this problem avoidance.

1. Common Problems with MDAPs

Many MDAPs have been plagued by problems such as cost overruns and production delays. Several GAO reports discuss these problems, including GAO-06–257T, *DOD Acquisition Outcomes—A Case for Change* (November 2005); GAO-06–409T, *DOD Wastes Billions of Dollars through Poorly Structured Incentives* (April 2006); and GAO-07–406SP and GAO-08–467SP, both titled, *Defense Acquisitions—Assessments of Selected Weapon Programs*, issued in March 2007 and March 2008, respectively.

GAO-06–257T states, "DOD has experienced cost overruns, missed deadlines, performance shortfalls, and persistent management problems" (2005, introductory page). GAO-06–257T also states that one of the reasons for these problems is that DOD often does not follow its own policy to use a knowledge-based approach in major acquisitions. This approach requires attainment of a certain knowledge level at critical junctures before investing more money in the next phase of system development (introductory page). GAO-06–409T further states that "programs lack clearly defined and stable requirements, …use immature technologies in launching product development, and fail to solidify design and manufacturing processes at appropriate junctures in development" (2006, 1). GAO-08–467SP reported on 72 MDAPs. GAO-08–467SP reiterated the findings of GAO-06–257T and GAO-06–409T, stating that of the 72 programs assessed, only two, the LUH and the Joint Cargo Aircraft, had the appropriate knowledge level achieved at the time of production start. Both of these were based on commercially available products (2008, 15). GAO-08–467SP further states that 88% of the programs reviewed did not have mature technologies at the beginning of system development, which is “the point at which significant financial commitment is made to design, integrate, and demonstrate that the product will meet the user’s requirements, and can be manufactured on time, with high quality, and at a cost that provides an acceptable return on investment” (4, 13 (quotation), 15).

In May 2009, Congress passed, and the president signed into law, the Weapon Systems Acquisition Reform Act of 2009. Among other things, this reform act requires periodic assessment of MDAPs’ technological maturity and “rescinding the most recent milestone approval for any program experiencing critical cost growth” (Schwartz 2014, 17–18). GAO reports issued in 2009 and later indicate that although not all MDAPs have fully implemented the requirements of the reform act, and although the problems described in the two immediately preceding paragraphs persist, these problems exist to a lesser extent than they did prior to passage of the reform act (GAO-13–294SP 2013, 31; GAO-13–103 2012, introductory page).

For example, GAO-13–294SP, *Defense Acquisitions—Assessments of Selected Weapon Programs,* issued in March 2013, reports higher knowledge levels at key junctures in the acquisition process, and decreases in program acquisition unit costs for a substantial percentage of MDAPs (12–13, 22–24). The MDAPs reporting higher knowledge levels were primarily those whose system development began within the five years previous to the publication of GAO-13–294SP. Specifically, GAO-13–294SP states that of 32 MDAPs that had begun system development, 19 (59%) had technology that was mature, or was nearing maturity, at the start of that process (22–24). Although this figure indicates the existence of a substantial percentage of MDAPs lacking technological maturity at the start of system development, 59% of MDAPs having technological maturity (or near maturity) at that point is a major improvement over the 12% figure reported in GAO-08–467SP (p. 4 of GAO-08–467SP). GAO-13–294SP further states that of 84 programs reporting program acquisition cost data, 42 showed an increase in buying power that was attributable to actual cost reductions (p. 13).

2. Problems with the UH-72A Acquisition

For the LUH, cost overruns and performance shortfalls have been a problem, although not to the same extent as for the MDAPs discussed in the GAO reports, particularly those issued during the time period 2005 through 2008. During initial operational testing, the helicopter cabins overheated, and they were found to be too small to allow a medic to treat two seriously ill patients on litters. Other problems, such as the helicopters not being designed for use in dusty, sandy environments, became apparent after the LUHs were fielded (McQueary 2007b, 22). See Section C.2 of Chapter III for a detailed discussion of these problems.

The information from various sources concerning the amount of money needed to correct these problems is not consistent:

1. Roxana Tiron's November 20, 2007 article, "Army Defends Light Chopper Amid Warnings it Could Fail," states that "the Army will…have to spend at least $14 million [emphasis added]"[1] to address the overheating problem. This represents an increase of approximately 0.5%, over the original purchase price of approximately $2.3B for 322 helicopters, but does not take into account the amount of money needed to address the problems of sand and dust ingestion and the problems of inadequate space in the MEDEVAC helicopters.

2. The Center for Strategic and International Studies' March 2009 report, "No. 7: Case Study—The Drivers of a Successful COTS Acquisition," states that as of April 2008, the funds needed to address the above-described problems, as well as the need for secure radios, had increased the total acquisition cost "by $209 million—from $1.9 to $2.1 billion (an 11% cost increase) [emphases added]."[2]

3. According to Megan Mokhtari's February 20, 2013 article, "Contracting Interns Receive Aviation Overview," the contractor actually delivered the aircraft under budget.

Although the figures shown by the cited information sources vary widely, none of them shows a cost increase of greater than 11%. By contrast, GAO-06–257T (2005, 2) reports on seven MDAPs whose unit acquisition cost increases ranged from 27% to 189%.

An article prepared in June 2009 by the then product manager, LTC James Brashear, stated that the LUH acquisition program was on cost. That article stated that a program's financial health is measured through the use of the metrics Average Procurement Unit Cost (APUC) and Program Acquisition Unit Cost (PAUC) (Brashear 2009).[3]

These metrics are defined as follows:

APUC = total procurement cost ÷ the number of articles to be procured[4]

PAUC = (Procurement dollars + Research and Development dollars + some support costs) ÷ the total number of units procured (Brashear 2009; Defense Acquisition University's Glossary of Defense Acquisition Acronyms and Terms 2012)

A 10% increase in either the PAUC or APUC over the baseline is a failure in managing the cost (Brashear 2009).

The PAUC and APUC baselines for the Lakota were set in June 2006. Several modifications to the LUHs, including some to address the above-described problems, were approved after that time, as were several Mission Equipment Packages (MEPs). These modifications and MEPs have PAUC/APUC implications (Brashear 2009). The program baseline was revised in August 2007 ("Selected Action Report (SAR) LUH as of December 31, 2011," 3, 18).

In June 2009, "the total growth of the LUH program [was] projected to be less than 2% over the entire length of the program" (Brashear 2009). The set of PAUC figures shown in Figure 1 that are based on Base Year dollars and on the June 2006 baseline indicate that through 2011, the LUH acquisition program experienced cost growth exceeding the predicted less than two percent growth rate. In fact, cost growth actually exceeded three percent during several consecutive years. Even so, as of December 2012, with approximately 85% of the total number of helicopters delivered, cost growth was only one and a half percent. Also, except for 2008, all of the PAUC figures based on Then Year dollars and on the June 2006 baseline showed negative cost growth. All of the PAUC figures based on the August 2007 baseline showed negative cost growth, both those based on Base Year dollars and those based on Then Year dollars. For 2010 through 2012, the APUC figures shown in Figure 2 very closely matched the PAUC figures (the author could not find APUC figures for 2008 or 2009.) Thus, most, although not all, PAUC and available APUC figures are consistent with the June 2009 prediction of a cost growth of less than two percent. All figures show that cost growth never approached an increase of 10%, which, according to Brashear (2009), would have been indicative of cost management failure. All computations showing these conclusions are shown in Figures 1 and 2.

Base Year | Then Year

PAUC based on **original June 2006** baseline:

Jun 06: $\frac{\text{Total Cost } \$1,638.3}{322 \text{ aircraft}} = \$5.088$ unit cost | $\frac{\text{Total Cost } \$1,883.0}{322 \text{ aircraft}} = \$5.848$ unit cost [5]

PAUC based on **revised August 2007** baseline:

Aug 07: $\frac{\text{Total Cost } \$1708.1}{322 \text{ aircraft}} = \$5.305$ unit cost | $\frac{\text{Total Cost } \$1961.7}{322 \text{ aircraft}} = \$6.092$ unit cost [6]

Base Year | Then Year

30 Sep 2008: $\frac{\text{Total Cost } \$1,819.8}{345 \text{ aircraft}} = \$5.275$ unit cost | $\frac{\text{Total Cost } \$2,090.2}{345 \text{ aircraft}} = \$6.064$ unit cost [7]

30 Sep 2010: $\frac{\text{Total Cost } \$1,808.3}{345 \text{ aircraft}} = \$5.241$ unit cost | $\frac{\text{Total Cost } \$2,003.6}{345 \text{ aircraft}} = \$5.808$ unit cost [8]

Dec 2011: $\frac{\text{Total Cost } \$1793.9}{345 \text{ aircraft}} = \$5.200$ unit cost | $\frac{\text{Total Cost } \$2004.7}{345 \text{ aircraft}} = \$5.811$ unit cost [9]

Dec 2012: $\frac{\text{Total Cost } \$1626.9}{315 \text{ aircraft}} = \$5.165$ unit cost | $\frac{\text{Total Cost } \$1809.3}{315 \text{ aircraft}} = \$5.744$ unit cost

PAUC changes based on June 2006 baseline:

2008:	\$5.275 / \$5.088 = 1.037	\$6.064 / \$5.848 = 1.037
2010:	\$5.241 / \$5.088 = 1.030	\$5.808 / \$5.848 = 0.993
2011:	\$5.200 / \$5.088 = 1.022	\$5.811 / \$5.848 = 0.994
2012:	\$5.165 / \$5.088 = 1.015	\$5.744 / \$5.848 = 0.982

PAUC changes based on August 2007 baseline:

2008:	\$5.275 / \$5.305 = 0.994	\$6.064 / \$6.092 = 0.995
2010:	\$5.241 / \$5.305 = 0.989	\$5.808 / \$6.092 = 0.953
2011:	\$5.200 / \$5.305 = 0.980	\$5.811 / \$6.092 = 0.954
2012:	\$5.165 / \$5.305 = 0.974	\$5.744 / \$6.092 = 0.943

Figure 1. PAUC calculations.

	Base Year	Then Year

APUC based on **original June 2006** baseline:

Jun 06: $\frac{\text{Procurement Cost \$1635.1}}{\text{322 aircraft}} = \text{\$5.078 unit cost}$ $\quad \frac{\text{Procurement Cost \$1879.9}}{\text{322 aircraft}} = \text{\$5.838 unit cost}$

APUC based on **revised August 2007** baseline:

Aug 07: $\frac{\text{Procurement Cost \$1704.9}}{\text{322 aircraft}} = \text{\$5.295 unit cost}$ $\quad \frac{\text{Procurement Cost \$1958.6}}{\text{322 aircraft}} = \text{\$6.083 unit cost}$

	Base Year	Then Year

Dec 10: $\frac{\text{Procurement Cost \$1806.0}}{\text{345 aircraft}} = \text{\$5.235 unit cost}$ $\quad \frac{\text{Procurement Cost \$2003.4}}{\text{345 aircraft}} = \text{\$5.807 unit cost}$ [10]

Dec 11: $\frac{\text{Procurement Cost \$1790.7}}{\text{345 aircraft}} = \text{\$5.190 unit cost}$ $\quad \frac{\text{Procurement Cost \$2001.6}}{\text{345 aircraft}} = \text{\$5.802 unit cost}$

Dec 12: $\frac{\text{Procurement Cost \$1623.7}}{\text{315 aircraft}} = \text{\$5.155 unit cost}$ $\quad \frac{\text{Procurement Cost \$1806.2}}{\text{315 aircraft}} = \text{\$5.734 unit cost}$

APUC changes based on June 2006 baseline:

2010:	\$5.235 / \$5.078 = 1.031	\$5.807 /\$5.838 = 0.995
2011:	\$5.190 / \$5.078 = 1.022	\$5.802 / \$5.838 = 0.994
2012:	\$5.155 / \$5.078 = 1.015	\$5.734 / \$5.838 = 0.982

APUC changes based on August 2007 baseline:

2010:	\$5.235 / \$5.295 = 0.989	\$5.807 / \$6.083 = 0.955
2011:	\$5.190 / \$5.295 = 0.980	\$5.802 / \$6.083 = 0.954
2012:	\$5.155 / \$5.295 = 0.974	\$5.734 / \$6.083 = 0.943

Figure 2. APUC calculations.

The LUH program has been largely free of management problems. The former product manager, James Brashear (2008a), stated, "We are combining training, disciplined requirements vetting and approval, plus a tightly integrated vertical and horizontal team…consist[ing] of TRADOC, Army National Guard, Army Staff, our product office and affiliated Army and DOD agencies." The product office worked together with the user community to develop mission equipment packages (MEPs) to enhance the capabilities of the LUHs (Brashear 2008a).

The cooperation between the various stakeholders, including the manufacturer, combined with the fact that the UH-72A is a non-developmental item, thereby obviating the need for time expenditure for development, enabled the achievement of several milestones in a much shorter time than is possible for most MDAPs (Brashear 2008a; EADS press release, "The UH-72A Light Utility Helicopter Enters Operational Service" June 19, 2007). For example, the Army's Aviation and Missile Command (AMCOM), the unit responsible for the LUH acquisition program, granted Full Materiel Release (FMR)[11] upon the initial request. AMCOM had never previously done so for any Army aviation system. FMR occurred on May 12, 2007, less than 11 months after contract award. The Army's first operational unit was equipped three days later (Brashear 2008(a); "The UH-72A Light Utility Helicopter Enters Operational Service"). Achievement of the First Unit Equipped (FUE)[12] milestone in such a short time represents an unusually rapid introduction for new aircraft (Brashear 2008a; "The UH-72A Light Utility Helicopter Enters Operational Service").

B. INITIATION OF THE LIGHT UTILITY HELICOPTER ACQUISITION PROGRAM AND BASIS OF DECISIONS CONCERNING THE ACQUISITION

This section describes the purpose of the LUH acquisition program. It also describes some of the respects in which the LUH acquisition program differs from many other MDAPs.

1. UH -72A's Predecessors and the Basis of the Decision to Replace Them

The UH-72As were acquired to replace the Vietnam era UH-1H ("Huey")[13] and OH-58 Kiowa[14] helicopters, which were reaching the end of their serviceable life and would need to be replaced, and also to free up Black Hawk UH-60 helicopters for active military operations overseas (Krussow 2012; Tegler 2009; "Light utility helicopter (LUH)" (Global Security) 2011). The Black Hawk UH-60 helicopters' size, capability, and operating expense was considered less than optimal for the types of missions for which the UH-72As were acquired ("LUH - Eurocopter UH-72A Lakota" (helis) n.d.). The purpose of acquiring UH-72As was to replace the Vietnam era helicopters with "a modern aircraft at lower procurement[,]…operational and sustainment costs than" the UH-60, the Army's primary utility helicopter (Brashear and Ringbloom 2007).[15]

2. Basis of the Decision to Replace the UH-72A's Predecessors with Commercial, Currently Produced, Federal Aviation Administration (FAA)-Certified LUHs

This portion of Section B explains why the Army took the unusual step of acquiring aircraft that was commercially available, and that met civilian, rather than military, certification standards.

a. Expeditious Replacement of Aging Helicopter Fleet at Reduced Cost with Latest Available Technology

The Army wanted to acquire the replacement LUHs quickly. Buying commercial helicopters which were already being produced, and which, with minor modifications, could meet the Army's needs, obviated the need to design and test a new helicopter, and to develop and inaugurate the manufacturing process for it, all of which could have taken seven to ten years, possibly longer (Hankins, n.d.; Thurgood and Burke 2010). Also, the Army chose to procure a commercial aircraft in order to "eliminate development costs and reduce life cycle logistics and support costs." (Gansler and Lucyshyn 2008, 30) An additional benefit of purchasing commercially available helicopters was that the Army obtained helicopters with advanced aviation technology ("AMEDD MEDEVAC innovations 1991–2011" 2012).

Furthermore, acquisition of commercial helicopters with already existing technology allowed for the acquisition of the helicopters using a fixed-price contract. Fixed-price contracts provide the contractor with "maximum incentive to control costs and to perform effectively[.]" (Federal Acquisition Regulation (FAR) 16.202–1 2014). In addition, such contracts "impose minimum administrative burden on the contracting parties" (FAR 16.202–1). Had the Army chosen to have a new helicopter designed, the contract for such a helicopter would have had to have been a cost-reimbursement contract, at least in part. In that situation, the Army would have foregone the benefits of using a fixed-price contract. See Section A.4 of Chapter III for more detail on the type of contract used to acquire the LUHs.

b. Obtaining the Benefits Provided by FAA Certification

Use of FAA certified LUHs allows the Army to use commercial parts for repair and maintenance, thereby obviating the need for the Army to maintain an inventory of Army-only parts, with the attendant cost (Thurgood and Bristol 2010b). Also, there was the expectation that the ability to use "commercial parts and commercial suppliers [w]ould result in improved availability and significant cost savings" (Gansler and Lucyshyn 2008, 33, 35 (quotation)). Also, the Army expected that by keeping "the aircraft maintained and certified to FAA standards…in the future the aircraft would retain some usable residual value for resale in the commercial market" (Bower 2006). In addition, the Operational Test and Evaluation Report stated that the Army accepted the FAA Standard Airworthiness Certificate in lieu of testing the UH-72As for crashworthiness or electromagnetic environmental effects (McQueary 2007b, 1). Use of FAA certified helicopters thus obviated the need for the Army to conduct some of the testing that would otherwise have been needed, and thus it saved the Army the time and expense that otherwise would have been needed to conduct these tests.

3. Basis of the Decision to Rely on Contractor Logistical Support (CLS) for Aircraft Maintenance, Pilot Training, and Maintenance

The Army expected that CLS would "reduce cost and turnaround times and would free up Army personnel to focus on high-priority mission areas" (Gansler and Lucyshyn 2008, 32). This expectation has been realized. CLS "has minimized the investment the Army has had to make in facilities…and training equipment" (Thurgood and Bristol 2010b).

C. LUH OVERVIEW

This section provides a general overview of the UH-72A acquisition, including its history, and a description of the UH-72A helicopter. It also provides information about the manufacturer of that helicopter.

1. History of the LUH Acquisition

This portion of Section C describes the history of the LUH acquisition from its initiation in 2004 through late 2014, at which time the acquisition program was nearly complete, although not totally complete.

a. Timeline

The major events that occurred during the course of the LUH acquisition program, and the dates those events occurred were as follows:

Date	**Event**
Feb 23, 2004	Announcement of decision to replace Vietnam era helicopters (Brownlee 2004)
Sep 30, 2005	LUH Capability Development Document (CDD) issued (McQueary 2007b, 2)[16]
Late Oct 2004	Draft Request for Proposal (RFP) W58RGZ-05-R-0004 issued with request for feedback from industry (FedBizOpps 2004)
May 3, 2005	Sources Sought Notice issued (FedBizOpps 2005)
Jul 26, 2005	Request for Proposal (RFP) W58RGZ-05-R-0519 issued (W58RGZ-05-R-0519)
Oct 20, 2005	Proposal Due Date (W58RGZ-05-R-0519 Amendment 6)
Feb-Mar 2006	Source Selection Performance Demonstration (McQueary 2007b, 5)
Feb 13, 2006	OSD delegated the LUH Program to the Army as an ACAT 1C (COTS) (Army Modernization Strategy 2008, A-15)
Jun 30, 2006	Award of W58RGZ-06-C-0194 to EADS for $43,090,522.00, with initial order of 8 LUHs at a unit cost of approximately $5.4 million (estimated contract value $2.3 billion, including options) (FedBizOpps, June 30, 2006; Gourley 2008; “Modernizing the Army’s Rotary Wing Aviation Fleet” 2007; “UH-72A Lakota Light Utility Helicopter (LUH)” (Global Security) 2011)
Nov 2006	Additional 34 helicopters for $170 million ordered for a total of 42 under Low Rate Initial Production (LRIP) (Gourley 2008; EADS press releases November 9, 2006, “EADS North America Receives a Second Production Order” and September 4, 2007, “U.S. Army UH-72A Receives Full-Rate Production Authorization”)

Dec 11, 2006	First UH-72A delivered (Brashear and Ringbloom 2007; “UH-72A Lakota light utility helicopter (LUH)” (Global Security) 2011)
Mar 2007	Initial Operational Tests (McQueary 2007b, 6)
May 12, 2007	Full Materiel Release (FMR) (Brashear 2008a)
May 15, 2007	First Unit Equipped (FUE) completed (Brashear 2008a)
July 2007	Operational Test and Evaluation Report issued (McQueary 2007b, cover page)
Aug 23, 2007	Approval of Full Rate Production (FRP) (Brashear 2008b; EADS press release September 4, 2007, “U.S. Army UH-72A Receives Full Rate Production”)
Dec 12, 2007	Army orders an additional 43 helicopters for $213.8 million, bringing the total number ordered to 85 (Brashear 2008b; “UH-72 Lakota Light Helicopter Lands Airbus in U.S. Defense Market” (Tactical Mashup) 2014)
Apr 7, 2008	Total number of helicopters to be acquired increased by 23 from initial quantity of 322 to 345 ($139.3 million increase) (“UH-72 Lakota Light Helicopter Lands Airbus in U.S. Defense Market” 2014; U.S. Department of Defense news release of April 7, 2008)
Oct 2008	Navy orders 5 helicopters for $24.8 million, in addition to those ordered by the Army (EADS press releases October 6, 2008, “EADS North America to Provide the U.S. Navy” and November 12, 2009, “EADS North America Delivers First H-72A Training Helicopter to the U.S. Navy;” “UH-72 Lakota Light Helicopter Lands Airbus in U.S. Defense Market” (Tactical Mashup) 2014)
Dec 2008	Army orders an additional 39 LUHs for $207.7 million, bringing total number ordered to 123 (EADS press release December 8, 2008, “EADS…Receives Order for 39;” “UH-72A Lakota Light Utility Helicopter” (Air Recognition), n.d.)
Jan 15, 2009	Army orders an additional 5 LUHs for $25.6 million, bringing total number ordered to 128 (“UH-72A Lakota Light Utility Helicopter” (Air Recognition), n.d.; “UH-72 Lakota Light Helicopter Lands Airbus in U.S. Defense Market” 2014)
Nov 12, 2009	First Navy helicopter delivered (EADS press release November 12, 2009, “EADS…Delivers First H-72A…to Navy”)

Dec 10, 2009	Army orders an additional 45 LUHs for 247.2 million, bringing total number ordered to 178 (Tegler 2009; EADS press release December 9, 2009, "EADS North America Receives $247 Million Contract for Light Utility Helicopter Program")
Oct 4, 2010	Army awards a $67 million contract to EADS for first 36 of 99 total helicopters with Security & Support (S&S) BN MEP (16 retrofits, 20 new). (EADS press release October 4, 2010, "EADS…Receives the First Phase of a $152 Million Contract;" "UH-72 Lakota Light Helicopter Lands Airbus in U.S. Defense Market" 2014)
Early 2011	Army orders an additional 32 helicopters, bringing the total number ordered to 219 (EADS press release February 9, 2011, "EADS…UH-72A…Program Continues On-Time")
Nov 2011	First helicopter with S&S BN MEP enters operational service (EADS press release November 5, 2011, "EADS…First Security and Support")
Jan 2012	Army awards EADS a $212.7 million contract for 39 helicopters, 32 with S&S BN MEP (EADS press release January 10, 2012, "EADS…awarded $212 Million Production Contract")
Mar 12, 2012	200th helicopter delivered (EADS press release March 12, 2012, "EADS…Delivers 200th UH-72A")
Nov 14, 2012	Army awards EADS a $181.8 million contract for 34 helicopters (24 with S&S BN MEP), bringing total number of helicopters ordered to 312) (EADS press release November 14, 2012, "EADS…Awarded $181.8 million")[17]
Apr 2013	Congress' proposed budget for 2014–2015 reduces planned total of UH-72As by 31, allowing for purchase of 10 aircraft (not the originally planned 31) in 2014 and zero in 2015 (not the originally planned 10) (Hemmerdinger 2014b)
Jan 2014	Congress passes budget providing $171 million for procurement of 20 (not 10) UH-72As and for spares, training, and other expenses (Hemmerdinger 2014b)
Mar 28, 2014	Sale of 6 UH-72As to Thailand approved ("Thailand to Buy Six UH-72A Lakota Helicopters" (DefenseWorld) 2014)
May 14, 2014	300th helicopter delivered (Airbus press release May 14, 2014, "Airbus Group Delivers 300th")

Sep 16, 2014	Potential sale of 9 additional helicopters to Thailand announced (Hoyle 2014)
Oct 2014	Army modifies W58RGZ-06-C-0194 to purchase 17 UH-72As equipped with airborne radio communications (ARC) radios for \$82,917,199, bringing total contract value to \$2,660,632,872 ("U.S. Army Places \$83-Million Order for 17 Lakotas" (*Vertical*) 2014)

b. Recent and On-going Developments

(1) Cut in total number of UH-72As to be acquired; partial restoration of that cut

For several years, the Army's intention was to purchase a total of 345 (raised from the initial intended total of 322) UH-72A helicopters. Following the order for 34 helicopters in November 2012 (Fiscal Year 2013), bringing the total number of helicopters ordered to approximately 312, the Army's initial intention was to order 31 helicopters in Fiscal Year 2014 and 10 helicopters in Fiscal Year 2015 (Hemmerdinger 2014b). Because of the sequestration cuts implemented in the spring of 2013, Congress and President Obama proposed reducing the total number of UH-72As acquired by 31 of the 41 remaining to be purchased during the final years of the acquisition program, and termination of the production of the UH-72As at the end of 2014, instead of having production continue through 2015 and into early 2016, as previously planned (Gore 2013; Hemmerdinger 2004b; Nelms 2013; DOD budget FY 2014, A-3A; EADS press release April 11, 2013, "EADS…CEO…Issues Statement"). Following vociferous protests by EADS, Congress passed a budget in mid-January 2014 that provided \$171 million for the UH-72A program, sufficient to fund the purchase of 20, rather than 10, UH-72As during Fiscal Year 2014, thereby reducing the total acquisition by only 21, rather than 31, helicopters (Hemmerdinger 2014b) (note: In October 2014, the Army ordered an additional 17 helicopters ("U.S. Army Places \$83-Million Order for 17 Lakotas" (*Vertical*) 2014)).

(2) Possibility of purchase of 100 additional UH-72A helicopters

The U.S. Army's budget proposal for Fiscal Year 2015 calls for the purchase of 100 new UH-72A helicopters, 55 in Fiscal Year 2015 and 45 in Fiscal Year 2016. If

Congress approves this budget proposal, these new helicopters will replace the single engine TH-67 training helicopters currently used at Fort Rucker, Alabama, which the Army now plans to retire (Hemmerdinger 2014a; McCleary and Weisgerber 2014). This is explained next.

(3) Strong probability of UH-72A redistribution

The original intention was that the Active Army would receive 135 UH-72As, and the Army National Guard would receive 210 UH-72As (Thurgood and Bristol 2010b). In 2013, Army leaders considered "retiring the active-duty Bell TH-67 Jet Ranger training helicopters" which are in use at Fort Rucker, Alabama, and moving about 100 Lakotas from the Active Army and 104 Lakotas from the Army National Guard to Alabama to be used for training purposes (McCleary and Tan 2013). This plan also involved transferring 111 Black Hawk helicopters from the active Army to the Army National Guard (McCleary and Tan 2013). (Although one of the original reasons for acquiring the UH-72As was to free up Black Hawk helicopters for use in combat, with the diminishing American presence in Afghanistan, the Black Hawk helicopters are no longer needed there (Warwick 2013)).

In the Army's Fiscal Year 2015 budget proposal, this plan was modified somewhat, calling for the Active Army to transfer nearly all of its UH-72As to Fort Rucker and 111 Black Hawks to the National Guard, but for the National Guard to retain its UH-72As (Carey 2014; *Posture of the United States Army* April 3, 2014).

These actions would be taken in conjunction with the total divestment of the remaining OH-58 Kiowa warrior helicopters (338 active-duty, 30 National Guard). The purpose of this proposed course of action is to save money and to reduce "the number of different helicopter types in the Army" (McLeary and Tan 2013 (quotation); Carey 2014).

(4) Thailand's purchase of UH-72A helicopters

On June 7, 2013, the Defense Security Cooperation Agency (DSCA) notified Congress of the possibility of Thailand purchasing six UH-72A helicopters. At that time, the estimated value of the proposed sale was $77 million (DSCA press release, “Thailand-UH-72A” 2014). On March 28, 2014, the U.S. Department of Defense announced the award of “a $34 million modified contract” for six UH-72A helicopters for the Royal Thai Army. Delivery of the helicopters is expected to begin in April 2015 (“Thailand to Buy 6 UH-72A” (*Defenseworld*) 2014 (quotation); “Thai Army to Get UH-72A” (*Airheads↑fly)* 2014). On September 26, 2014, DSCA notified Congress of Thailand’s possible purchase of an additional nine UH-72As along with “related support services and spare parts” (Hoyle 2014). The estimated value of this additional potential sale is $89 million (Hoyle 2014; Tomkins 2014a). The benefits of these sales include a furthering of Thailand’s goal to upgrade and modernize its equipment, and an increase in the interoperability between the United States and Thailand. Also, these sales will enhance the United States’ security by enhancing the security of a country that is friendly to the United States (Hoyle 2014; “Thailand-UH-72A” 2014). In addition, the initial sale of helicopters to Thailand is very likely to lead to at least one, and possibly more, follow-on sales to Thailand, and possibly also to other friendly countries (Hoyle 2014; Mehta 2013).

(5) Consideration of UH-72A as a basis for developing an armed aerial scout (AAS) helicopter

The Armed Aerial Scout program was the Army’s third attempt to replace the OH-58D Kiowa Warrior helicopters, which are used primarily for scouting and armed reconnaissance, and have been in use for that purpose since the early 1990s (Shalal-Esa 2012; “Bell OH-58 Kiowa” (Wikipedia) 2014). (The first two attempts were the RAH-66 Comanche and the Bell ARH-70 Arapaho helicopter programs, which were cancelled in early 2004 and in October 2008, respectively, both largely due to cost overruns, and in the case of the Arapaho, also due to delays (“Boeing-Sikorsky RAH-66 Comanche” (Wikipedia) 2014; Bell ARH-70 “Arapaho” (Wikipedia) 2014)).

The Army issued a Sources Sought notice, W58RGZ-09-R-0129, on November 7, 2008 (FedBizOpps) and a Request for Information, W58RGZ-10-R-0175, on January 26, 2010 (FedBizOpps). In the fall of 2012, four manufacturers, including EADS, Bell Helicopter, Boeing, and Augusta-Westland, demonstrated their armed aerial scout helicopters. (Sikorsky also offered an armed aerial scout helicopter, but it had more advanced technology than those offered by the other four manufacturers, and Sikorsky did not have a prototype ready for demonstration). EADS demonstrated two aircraft, the AAS72-X and the AAS72-X+, both of them armed versions of the UH-72A, the AAS-72X+ being an upgraded version, having a fully digital glass cockpit and improved engines, which each add 200 horsepower of thrust (Insinna 2013; Parsons 2012; “Armed Aerial Scout” (Wikipedia) 2014).

Army Secretary John McHugh determined that none of the five manufacturers’ helicopters demonstrated met the Army’s needs, stating that “none of them had capabilities that justified the cost of kicking off a new program” (Insinna 2013 (quotation); “Armed Aerial Scout” (Wikipedia) 2014). The Army then decided that proceeding with the AAS program would be accomplished either by a new development program or by a Service Life Extension Program for the Kiowa Warrior helicopters (Warwick 2013).

The Army terminated the Armed Aerial Scout program in late 2013, mostly due to the sequestration cuts implemented earlier that year, making the expected $16 billion dollar cost of the program too expensive for the Army to afford, and partly due to the end of the war in Iraq, and the approaching end of the United States’ military presence in Afghanistan, diminishing the need for new scout helicopters (McCleary 2013; “Armed Aerial Scout” (Wikipedia) 2014). (The $10 billion cost of upgrading the Kiowa helicopters was determined to be impractical, given their age and vulnerability, due to their light armament and armor. This led to the decision to totally retire the Kiowa helicopters over the next five years (Freedberg 2014)).

2. Characteristics and Capabilities

This portion of Chapter II’s Section C describes the physical attributes of the UH-72A helicopters. It also states what capabilities these helicopters possess. In addition, it describes the respects in which the physical characteristics and capabilities of the UH-72As differ from those of other helicopters.

a. General Description of the UH-72A

The UH-72A is approximately 33½ feet long, including the tail (42½ feet with the rotors turning), 11½ feet high, including the main rotor, and the fuselage is approximately five and a half feet wide. The diameters of the main and tail rotors are about 36 feet and six and a half feet, respectively. The UH-72A weighs 3,950 pounds when empty, and it can carry a maximum payload of 3,953 pounds, yielding a maximum take-off weight of 7,903 pounds (Oestergaard 2014). Figure 3 shows a photograph of a UH-72A helicopter.

Figure 3. UH-72A helicopter.
Note the large windows (see Chapter II, paragraphs C.2.*a* and C.2.*b*.5).
(from Global Security's website [no date],
http://www.globalsecurity.org/jhtml/jframe.html#http://www.globalsecurity.org/military/systems/aircraft/images/uh-72-a_army-mil-2006–12–13–142838.jpg|||)

The Lakota has a sliding door on each side, each with a large window, and windowless clamshell doors at the rear (Bower 2006; Nelms 2009; "UH-72A Lakota" (Military-Today), n.d.; Global Security website (photograph), n.d.). The cockpit accommodates a two-person crew ("UH-72A Lakota" (Military-Today), n.d.). The cabin can be configured for transportation of passengers or cargo, or for medical evacuation (MEDEVAC). The cabin can carry up to eight passengers when in the standard configuration (Bower 2006; UH-72A Specifications, n.d.; UH-72A Factsheet, n.d.).[18] In the MEDEVAC configuration, the UH-72A can carry two litters and two medical attendants (EADS feature story, March 12, 2009, “The First MEDEVAC Configured UH-72As are Delivered”).[19]

The UH-72A has twin Turbomeca Arriel 1E2 turboshaft engines, each having 738 horsepower, and “each providing 550kW of take-off power and 516 kW of continuous power” (“UH-72A Light Utility Helicopter, United States of America” (Army Technology) 2014 (quotation); Oestergaard 2014). The engines are rated to provide 404 kW continuously when flying with one engine inoperable (“UH-72A Light Utility Helicopter, United States of America” (Army Technology)). The second engine increases the aircraft’s range and speed (Soucy 2009). The two engines provide a helicopter cruising speed of 131 knots (151 miles/hr (mph)) and a maximum speed of 145 knots (167 mph), and enable a rate of climb of 1,600 feet per minute. The UH-72A has a range of 370 nautical miles (426 land miles) when cruising at 131 knots (Oestergaard 2014; Nelms 2009). It can fly for 3.2 hours without refueling (Thurgood and Gore 2011, slide 21). It can “take off and fly in winds up to 50 knots” (about 60 mph)—a useful feature for use in hurricane season (Orrell 2009).

Although many of the types of missions for which the UH-72A’s use is intended can be accomplished with only one engine, the redundant engines are a boon because they increase the safety of the aircraft, both for its occupants and the people over which the aircraft flies (Soucy 2009). If one engine fails, the remaining engine provides sufficient power for safe operation of the helicopter. In addition to the redundancy provided by the twin-engine design, the UH-72A also has “redundant hydraulic, electrical and engine control systems” (“UH-72A Light Utility Helicopter, United States of America” (Army Technology) 2014). The redundancy of these systems likewise increases the safety of the aircraft (“UH-72A Light Utility Helicopter, United States of America” (Army Technology) 2014).

b. *Beneficial Features of the UH-72A Helicopter*

In addition to the redundant engines and redundant hydraulic, electrical and engine control systems, the UH-72A helicopters have several desirable attributes which are a boon to their users. Such attributes include:

(1) Almost totally automatic navigation and flight control

The UH-72A has a[20] Sagem[21] three-axis autopilot[22] and dual Garmin global positioning system (GPS) auto-approaches, "one of which is linked to the autopilot" (EADS feature story March 12, 2009, "The First MEDEVAC Configured UH-72As are Delivered" (quotation); Krussow 2012; Nelms 2009). At least one pilot has commented favorably on the reliability of the navigational GPS system (Cross 2008). "One of the dual GPS systems is coupled to the autopilot to provide auto-navigation" (Nelms 2009). The pilot simply has to enter the settings for navigation or for flight control, and the aircraft does the work. The UH-72A has full automatic stabilization, which allows hands-off flight, and to some extent, hands-off hovering. This high degree of automation greatly decreases the pilot's workload, and it allows the pilot to focus attention on decision making and "other mission tasks in the cockpit" (EADS feature story, May 6, 2009, "At the Army Aviation Show" (quotation); Nelms 2009). The decreased workload also helps to reduce pilot fatigue on long missions ("At the Army Aviation show"). It also makes it possible for the UH-72A to be readily flown by one pilot instead of two (Krussow 2012; "At the Army Aviation Show"). The high degree of automation has one drawback in that it creates the possibility that pilots could become lax (Nelms 2009).

(2) Information displays which simplify the pilots' monitoring

The First Limit Indicator (FLI), which shows the limiting parameter for the engine functions torque, turbine outlet temperature and N1 (the percentage of design rotational speed in revolutions per minute of the low pressure compressor), "takes information from six different sensors (three for each of the two engines) and combines them on one display rather than six analog gauges" ("At the Army Aviation Show" May 6, 2009 (quotation); Krussow 2012; "UH-72A Limits" (Quizlet) 2012; "On a turbine powered airplane, what does the n1 and n2 on the instrument panel mean?" (Yahoo!

Answers https://answers.yahoo.com/question/index?qid=20081108213940AAdfb0z). This simplifies engine and torque monitoring because the pilot only has to monitor one gauge, instead of six. Pilots can monitor vital information without extensive instrument scan. This enables pilots to "dedicate more of their attention to the mission" (*EC145 Technical Data* 2006, 7 (quotation); Krussow 2012). Unlike the UH-1, and like "most glass cockpits in modern helicopters, the FLI does not provide the specific data" for the three parameters, torque, temperature, and N1 (Nelms 2009). It "simply lets the pilot know if one of…[those]…parameters is being exceeded" (Nelms 2009). This feature "eliminates unnecessary data from consideration" and allows the pilot more time to observe outside the aircraft and to actually fly the aircraft (Bower 2006).

(3) Radios that can communicate with the radios of civilian agencies

The UH-72A has VHF, UHF and FM radios in the 400 to 800 megahertz (MHz) range, which enable such communication. Eurocopter installed these because the Army found that "[d]uring disaster relief operations following Hurricane Katrina in 2005,…its helicopters were unable to communicate with many civilian agencies[,]" such as law enforcement personnel, fire departments, and hospitals (Nelms 2009).

(4) A radio system that allows for pilot preprogramming of three VHF frequencies

This is "an advantage when operating in area requiring multiple frequency changes over a short period of time" (Nelms 2009).

(5) Excellent visibility and a design that enhances helicopter versatility

The cockpit and cabin canopies are largely glass. (See the photograph in Figure 4). This provides good visibility for the aircraft's crew and passengers (Chavanne 2008; "UH-72A Lakota Light Utility Helicopter, United States of America" (Army Technology) 2014). The large amount of glass in the canopy does have a drawback in that it lets in a large amount of sunlight, thereby leading to increased temperatures inside the helicopter (Chavanne 2008). The problem of elevated temperatures inside the helicopter will be discussed in paragraphs C.1 and C.2.*b*.(1) of Chapter III and in paragraph A.1 of Chapter IV.

Figure 4. UH-72A helicopter cockpit and cabin.
(from Thurgood and Bristol 2010a)

Another feature contributing to the good visibility that the UH-72A affords the crew and passengers is the absence of pillars or posts in the cockpit and the cabin. This absence eliminates view obstructions (Krussow 2012). It also contributes to the versatility of the helicopter, helping to enable its ready re-configuration between seating for multiple passenger transport and MEDEVAC configuration, a feat whose easy accomplishment is possible because the seats in the UH-72A can be removed within minutes (Bledsoe 2013; Bower 2006; "Guard Units Receive More High-Tech Lakota Helicopters" (ARNEWS) 2008).

An additional example of the UH-72A's versatility is that it provides good visibility during nighttime, as well as daytime, operations. This is because "[t]he cockpit is arranged and lit to be compatible with night vision goggles" (*Army Weapons System Handbook* 2011, 212). This feature makes the UH-72A ideal for use in nighttime medical evacuations and search and rescue operations (Krussow 2012).

The UH-72A's sliding side and outward-swinging rear clamshell doors further contribute to its versatility. Up to four people can simultaneously rappel out of the side doors, one each of which is located on each side of the aircraft. This is a useful feature for high risk and time critical missions, such as deployment of SWAT teams (Krussow

2012). The aircraft can be flown with the side doors open. The side doors can be easily removed (Bower 2006). The rear clamshell doors facilitate safe and easy loading and unloading (EADS feature story March 12, 2009 “The First MEDEVAC Configured UH-72As are Delivered”). (See Figure 5.) It is easier to load patients for medical evacuation through rear doors than through side doors (Dubiel 2009).

Figure 5. UH-72A helicopter (rear view).
(from “The First MEDEVAC-Configured UH-72As are Delivered to the National Guard,” EADS feature story March 12, 2009, http://www.uh-72a.com/news-feature-story/2009/03–13–09-dc-guard-delivery-ceremony.asp)

This photograph shows the inside of the UH-72A in its MEDEVAC configuration with the rear clamshell doors open. Note the following:

1. The extensive wall mounting of equipment.
(This allows more litter space in the aircraft, thereby allowing more room for the medical attendant to provide care to evacuees (McQueary 2007b)).

2. The rails to which the stretchers are attached.
(These rails enable the easy reconfiguration of the UH-72A for various uses, including varied seating arrangements in the standard configuration, and the MEDEVAC configuration shown here. The rails can also be used to secure cargo (Bower 2006; Krussow 2012)).

(6) A rotor system design which enhances helicopter utility

The location of the rotors enhances the UH-72A’s fitness for use for medical evacuations. The main rotor and the tail rotor are high set, with the tail rotor having a blade tip clearance of 1.997 meters (about six and a half feet) above the ground. This allows for fast and safe loading through both the main doors and the rear clamshell doors, "even while the rotors are turning" ("UH-72A Lakota Light Utility Helicopter, United States of America" (Army Technology) 2014 (quotation); "UH-72A Lakota Light Utility Helicopter" (Air Recognition), n.d.; Bower 2006).

Another beneficial aspect of the UH-72A's rotor system is that the rotor system is a hinge-less, rigid rotor system. This allows the UH-72A to fly more quietly and with less vibration than most helicopters. The low vibration level makes it easy to do intravenous injections while the UH-72A is in flight. This was difficult, if not impossible, to do in the UH-1 helicopter (Krussow 2012; Nelms 2009). In addition, the low vibration helps to decrease pilot fatigue (EADS feature story, May 6, 2009, "At the Army Aviation Show"). The rigid rotor system also provides greater stability when hovering, and it "allows for a wider center of gravity[.]" (Krussow 2012). The helicopter can thus perform well even when four people operate on the same side of it (Krussow 2012). Another benefit of the rigid rotor system is that it enhances aerodynamic efficiency ("UH-72A Lakota Light Utility Helicopter" (Air Recognition), n.d.).

(7) Small size

The relatively small size of the UH-72A provides several benefits, including enhancement of its utility for medical evacuation and search and rescue operations. The UH-72A has a shorter length (42.7 feet (ft) with the rotors rotating) and lower weight (3950 lbs) than other utility helicopters (UH-1: 57 ft, ~5,215 lbs;[23] UH-60: 65 ft, ~11,516 lbs[24]) (Nelms 2009; Oestergaard 2014). (See Table 1).

(a) The shorter length provides the following advantages:

(i) It can easily land on small landing zones, such as hospital helipads.

(ii) It is easily transportable.

Five UH-72As can fit into a C-17 transport airplane, if two of the UH-72As have their rotors removed, and the other three have the blades folded (Nelms 2009).

(b) Due to its lower weight, the UH-72A produces diminished rotor wash.[25] The diminished rotor wash makes operations much easier for ground personnel and for rescuers when the UH-72A is used for medical evacuation, especially when operating in a small landing zone, such as a hospital helipad (Krussow 2012; Nelms 2009).

(8) External hoist on helicopters in the MEDEVAC and S&S configurations

Helicopters in the MEDEVAC and S&S configurations are equipped with an external hoist (Thurgood and Gore 2011, slides 23 & 24). Having an external, rather than an internal, hoist further contributes to the utility of the UH-72A for use in medical evacuation and other rescue operations. The external hoist saves a substantial amount of space inside the helicopter (Soucy 2009). The hoist is electric and "is mounted on a boom and support assembly that allows it to be positioned in an arc of up to 63^{o} from the" centerline of the helicopter body, thereby providing "maximum operational flexibility" ("UH-72A Lakota Light Utility Helicopter, United States of America" (Army Technology) 2014). The hoist is mounted on the right side of the helicopter above the sliding side door, just behind the pilot's seat, thereby allowing the pilot a good view of the rescue operation (Krussow 2012). (See the photograph in Figure 6.)

Figure 6. UH-72A helicopter with external hoist.
(from Defence Industry Daily's website (no title, no date), http://media.defenceindustrydaily.com/images/AIR_EC145_Rescue_Hoisting_lg.jpg)

c. Comparison of the UH-72A against the Helicopters it Was Purchased to Replace or Partially Replace, and against the EC-145 from which It Was Derived

This portion of Section C states how the UH-72A helicopters differ from the OH-58, UH-1H, OH-60 and EC-145 helicopters.

Table 1. Comparison of the UH-72A against the OH-58A, the UH-1H, and the UH-60L.

	Empty Weight (lbs)	**Length (Rotors Turning) (feet)**	**Height to Top of Main Rotor (feet)**	**Engines (Number of, shp)**	**Useful Load (lbs)**	**Cruising Speed (mph)**	**Range (miles)**
UH-72A Lakota	3950	42½	11½	2, 738 ea	3953	151	426
OH-58A Kiowa	1583	32	9½	1, 317	1417	117	299[26]
UH-1H "Huey"	4899 – 5914[27]	57[28]	13½ – 15[29]	1, 1400[30]	3600 – 4368[31]	125 – 139 [32]	198 – 345[33]
UH-60L Blackhawk	10,624 – 11,519[34]	65[35]	17[36]	2, 1844 – 1994 ea[37]	10,461 – 12,984[38]	173 – 183[39]	1324 – 1381[40]

(1) Comparison against the helicopters being totally or partially replaced

As the information in Table 1 shows, the UH-72A differs from its predecessors and from the UH-60 (Blackhawk) as follows:

(a) OH-58

The OH-58 is a much smaller helicopter than the UH-72A, and it has only a single engine. It has less than half the horsepower and useful load capacity of the UH-72A. Its cruising speed and range are roughly ¾ those of the UH-72A. In addition to the tabulated differences between the OH-58 and the UH-72A, the UH-72A has both instrument flight rules (IFR) and visual flight rules (VFR) capabilities, thereby allowing flight at night and under low visibility weather conditions, while the OH-58 has VFR capabilities only; therefore it can be operated only when light and weather conditions allow the pilot to fly the aircraft solely by visual cues (Robinson 2013; Wikipedia articles: "Visual Flight Rules" (2014), "Instrument Flight Rules" (2014)).

(b) UH-1H

The UH-1H is a longer, heavier and taller helicopter than the UH-72A. The smaller size of the UH-72A provides several advantages, which are discussed in paragraph C.2.*b*.(7) of this chapter. According to a majority of the information sources consulted, the UH-1H can carry a heavier load than the UH-72A can. This greater load capacity provides only a minor advantage to using the UH-1H over using the UH-72A. All information sources consulted show the load capacity of the UH-1H as exceeding the load capacity of the UH-72A by 10% or less. Also, the UH-72A can fly faster and has a greater range.

In addition to the differences shown in Table 1, the UH-72 A and the UH-1H differ in the following respects:

(i) When UH-72A is in MEDEVAC configuration, stretchers slide along rails that secure them to the floor. In the UH-1, stretchers were hung from straps (Nelms 2009). Thus, in the UH-72A, the stretchers are held in a more stable position.

(ii) The UH-72A has a rotor brake. The UH-1 did not. The rotor brake on the UH-72A diminishes the amount of time that the pilot needs to wait for rotor blades to stop turning after landing the helicopter (Nelms 2009).

(c) UH-60

As is the UH-1H, the UH-60 is longer, heavier, and taller than the UH-72A. It has more than twice the horsepower, nearly three times the useful load capacity and more than three times the range of the UH-72A, and it can fly at a higher speed than the UH-72A can.

Also, it can carry 11 combat equipped troops or six stretchers, as opposed to the eight (or nine) passenger or two-stretcher capacity of the UH-72A ("Sikorsky UH-60 Blackhawk" (Aeroweb) 2014). The UH-60 can thus accomplish many missions for which the UH-72A lacks the capability. For those missions that are within the UH-72A's capability, its lower purchase and operating costs make it advantageous to use it in lieu of the UH-60. (The purchase price of the UH-60 is about $16½ million ($22 million fully equipped), as compared to the approximately $6 million ($8 million fully equipped) purchase price of the UH-72A (Drwiega 2012). The operation and maintenance costs for the UH-72A are half those of the UH-60 (Orrell 2012).[41] One aspect of the lower operation costs for the UH-72A is that fuel costs for the UH-60 exceed the fuel costs for the UH-72A by more than 20% (McQueary 2007b, 20). According to SGT Aaron LeBlanc (2011), use of UH-72A helicopters in Haiti in the spring of 2011 resulted in a savings of nearly $3,000 per flight hour over what it would have cost to use the UH-60 exclusively.) Additionally, for missions for which a smaller helicopter size is beneficial, such as those requiring landing in a small space, use of the UH-72A in lieu of the UH-60 provides significant advantages. (See paragraph C.2.*b*.(7) of this chapter.)

(2) Comparison against the EC-145

The UH-72A differs from the EC-145, the civilian helicopter from which it was derived, in the following respects:

(a) The UH-72A has nose-mounted wire cutters and extensions on the skids to direct wire below the skids if the helicopter hits a wire below the nose but above the skids. The EC-145 does not have this.

(b) UH-72A has much more extensive radio communication than the EC-145.

(c) “The EC-145 has optional twin windows in the rear clamshell doors” (Nelms 2009). The UH-72A lacks this feature (Nelms 2009).

(d) Air conditioning is a standard feature in the EC-145. Air conditioning can be, and often is, added to the UH-72A, particularly to those helicopters used for medical evacuation, but it is not a standard feature. The military tends to avoid including air conditioning in its aircraft in order to reduce weight and improve performance. (The Blackhawk helicopters do not have air conditioning). The initial intention to totally or mostly avoid equipping UH-72As with air conditioning was not realized, because, as will be discussed in paragraphs C.1 and C.2 of Chapter III and paragraph A.1 of Chapter IV, during initial operational testing and evaluation (IOTE), temperatures inside the UH-72A became unacceptably high, even at moderate ambient temperatures, thereby necessitating the addition of air conditioning to some UH-72A helicopters (Davis 2007).

d. Description of the Various MEPs of the UH-72A

The paragraphs C.2.*a*–C.2.*c* of this chapter describe the standard configuration of the UH-72A. The sub-paragraphs of this paragraph C.2.*d* provide descriptions of the UH-72A with its MEDEVAC and its various other MEP configurations.

(1) Medical evacuation (MEDEVAC)

Prior to the sequestration cuts implemented in 2013, the intention was to purchase 90 UH-72As in the MEDEVAC configuration (Bristol 2010 slide 6).

As stated in paragraph C.2.*a* of this chapter, when in the MEDEVAC configuration, the UH-72A carries two litters and can accommodate two medics (according to some sources, only one medic) to treat the people on the litters. The medics sit on two rear-facing seats behind the pilot and co-pilot (EADS feature story, March 12, 2009, "The First MEDEVAC UH-72As are Delivered"). The MEDEVAC-configured UH-72As are equipped with the following equipment (Thurgood and Gore 2011, slide 24).

(a) A medical supply unit

(b) Some units (those to be used in dusty, sandy environments) have an engine inlet barrier filter (EIBF).

The purpose of these barrier filters is to prevent sand and dust from being ingested into the helicopter engines, and thereby eroding the compressor blades (Gourley 2010). (See paragraph C.2.*b*.(2)(a) of Chapter III for more detail).

(c) Air conditioning

(d) An external mounted hoist, as described in paragraph C.2.*b*.(8) of this chapter (Thurgood & Gore 2011, slide 24).

(2) Security and Support (S&S)

Prior to the sequestration cuts, the intention was to purchase approximately 100 UH-72As with the S&S MEP UH-72A Lakota ("UH-72A" (STAND-TO!) 2011). Sixteen of them were retrofits to previously produced helicopters, and the rest were to be manufactured with the S&S MEP (Robinson 2013; Bledsoe 2011; EADS press releases of October 10, 2011, "EADS…Begins Deliveries of Lakota…with an Advanced Mission Equipment Package" and November 5, 2011, "EADS North America's First Security and Support").

Helicopters with the S&S MEP are used for homeland security and defense and civil law enforcement support missions, including drug interdiction and border patrol. They are also used for responding to natural and man-made emergencies, such as hurricanes and terrorist attacks (Nelms 2012b). In addition, they are used for wilderness firefighting support. In that capacity, they are used for surveillance, fire mapping, and command and control, while larger helicopters, such as CH-47D Chinooks and UH-60 Blackhawks, do the actual fire extinguishing (Robinson 2013). (A UH-60 can carry 660 gallons of water, while a UH-72A can carry only about 168 gallons of water (Bruce 2014; McQueary 2007b; Rowlett 2005).

The S&S MEP consists of:

(a) "[A] nose mounted center line payload with" an L-3 Wescam MX-15i electro-optical infrared (EO/IR) camera and laser pointer (EADS press release August 12, 2010, "The UH-72A Lakota Makes First Flight…" (quotation); Bledsoe 2013; MX-15 (Wescam) July 2012).

The camera is very sensitive. Viewers of its images can see people's footprints. The EO/IR sensor enables crew members to see as clearly at night as during the daytime (Bledsoe 2013). The camera can view objects from five miles away. This enables people in the helicopter to monitor people on the ground without the people on the ground knowing that they are being watched. This feature greatly enhances the usefulness of the S&S-equipped helicopters for drug interdiction missions ("Louisiana National Guard Helicopters Get High-Tech Equipment" 2011).

(b) A EuroNav moving map system

This moving map system is GPS-enhanced and interfaces with the camera and the navigation system (Bristol 2010, slide 7; Dubois 2012). The moving map system can provide the exact location of the helicopter to anyone in it, and can direct the helicopter to a specific street address. It also allows for database searches (Malone 2011; Nelms 2012b). It has all the city street maps for the entire United States, as well as nautical charts for all coastal areas, and IFR and aeronautical charts. It can house topographical maps for the entire country (Robinson 2013).

(c) Two 10.4-inch cockpit touch screen displays (one for the pilot and one for the co-pilot) (Robinson 2013)

These touch screen displays display the moving map and the EO/IR images, and they have soft keyboards[42] (Bristol 2010, slide 7; Robinson 2013). The UH-72A is the first Army helicopter so equipped (Bledsoe 2011).

(d) A cabin console with a 15-inch video display

This enables a crew member in the cabin, as well as the pilot and co-pilot, to see the camera's images (Robinson 2013).

(e) A digital video recorder and a Sierra Nevada Tactilink-Eagle data downlink system

The digital video recorder (manufactured by SkyQuest) has a recording capability equal to or exceeding three hours (Bristol 2010, slide 7). The data downlink system can provide "real time video downlinks to ground stations" (and also still images) (Nelms 2012b). It thereby allows people on the ground using a handheld receiver to see the view provided by the helicopter's camera (Nelms 2012b; Malone 2011; Osborn 2011; Robinson 2013; EADS press release November 5, 2011, "EADS North America's First Security and Support"). "The receiver has a range of 25 to 30 miles and can read a license plate up to a mile away" ("Louisiana National Guard Helicopters Get High-Tech Equipment" 2011).

(f) A 30-million candlepower searchlight

The searchlight is mounted on the right rear of the helicopter and is slaved to the EO/IR camera (Bristol 2010, slide 7; Robinson 2013). According to Squatritro-Martin (2009), it "can light up a city block."[43] The lighting capacity of the searchlight combined with the sensitivity of the EO/IR sensor make the S&S-equipped helicopters particularly useful for search and rescue operations, especially at night. In addition, because the S&S-equipped helicopters provide good night-time vision, their users can avoid obstacles such as wires, poles, and antennae, even in total darkness (Bledsoe 2013).

(g) An airborne radio communications (ARC) 231 radio system

This radio system uses two Cobham (formerly Wulfsberg) Receiver ARC Transmitter (RT)-5000 AM/FM multi-band radios each with a single control head to enable cross-band communication with civilian law enforcement, emergency medical services agencies, and with hospitals. These bands in these radios can operate from 29.7 to 960 megahertz (Mhz) (Bristol 2010, slide 9; McHale 2011a; Nelms 2012b). The radio system allows for simultaneous transmission on multiple bands, including both those used by military agencies and those used by civilian agencies (Nelms 2012b).

(h) An external mounted hoist

Helicopters with the S&S MEP have the same hoist equipment as the MEDEVAC helicopters (Bristol 2010, slide 7; Robinson 2013; Thurgood and Gore 2011, slide 23).

(i) An engine inlet barrier filter (EIBF) on some units (Bristol 2010, slide 5)

(3) Combat Training Center (CTC) MEP

Prior to the sequestration cuts, the intention was to purchase 40 UH-72As with the CTC MEP, all of them for the active Army (Thurgood and Gore 2011, slide 22). As the name indicates, helicopters with the CTC MEP are used to train pilots for combat and "to teach soldiers how to…recognize friend or foe on the battle space" (EADS feature stories October 26, 2010, "Lakota Variants Bring Enhanced Capabilities" (quotation) and March 4, 2010, "Expanding Missions for the UH-72A").

They are also used for support missions, including carrying observers who "oversee war game scenarios performed against 'aggressor' aircraft" ("Expanding Missions for the UH-72A"). There are two versions of the CTC MEP, the Observer/Controller (OC) and the Opposing Force (OPFOR). The OPFOR aircraft play the role of enemy aircraft, while the OC aircraft are used for observing the training missions ("UH-72A on European Ground," n.d;[44] EADS feature story, May 17, 2010, "A Lakota 'Family Photo'").

Both the OC and OPFOR helicopters are equipped with a second ARC 231 radio, an Electronic Data Manager (EDM), and a Smart Onboard Data Interface Module (SMODIM) (Thurgood and Gore 2011, slide 23; "UH-72A on European Ground," n.d. (probably 2010)). (The SMODIM "provides simulated weapons engagements and real time performance monitoring." ("SMODIM—Smart Onboard Data Interface Module" 2014) In the latter capacity, the SMODIM "actively monitors, tracks, records and transmits exercise to the ground station for real time observation and [later] playback" ("SMODIM—Smart Onboard Data Interface Module" 2014). The SMODIM also processes "data received from the ground station" and selects targets ("SMODIM—Smart Onboard Data Interface Module" 2014)).

In addition to this listed equipment, the OC version also includes an external public address system and an Observer Controller Communication System (OCCS) (Bristol 2010, slide 5; "UH-72A Lakota on European Ground," n.d. (probably 2010)).

In addition to this listed equipment, the OPFOR version includes special camouflage paint (see Figure 7), a Multiple Integrated Laser Engagement System/Tactical Engagement Simulator System (MILES/TESS), and an Aircraft Kill Indicator (AKI). "Tactical Engagement Simulation is a training system for using weapons" ("Tactical Engagement Stimulation" (Wikipedia) 2014). It uses laser transmitters in lieu of ammunition ("Tactical Engagement Stimulation"). The MILES uses laser beams "to simulate actual weapon fire" (MILES Operator's Manual, 1984, 1–10[45]). It has laser detectors on the exterior of the helicopter which sense enemy fire and determine its accuracy and simulated damage (MILES Operator's Manual, 1–10). An AKI indicates by means of "an external flashing signal light" that a helicopter is under opposing fire (or has received a simulated hit or near-hit) and whether or not that simulated hit is sufficient to disable the helicopter or cause a fatality (MILES Operator's Manual, 1–3, 1–4).

Figure 7. UH-72A helicopter with CTC MEP in OPFOR configuration. (from "Expanding Missions for the UH-72A are Highlighted at the 100th Lakota Delivery Ceremony," EADS feature story March 4, 2010, http://www.uh-72a.com/news-feature-story/2010/03–04–2010.asp)

This photograph shows the camouflage paint pattern. This pattern helps conceal the aircraft in desert environments (Robinson 2012). Also, for training purposes, it identifies the helicopter as an OPFOR helicopter (Blottenberg 2010).

(4) VIP

Prior to the sequestration cuts, the intention was to purchase 14 UH-72As with the VIP MEP (Bristol 2010, slide 6). The VIP MEP is used for transporting key personnel, military, and civilian (Bristol 2010, slide 24; "UH-72A Lakota Light Utility Helicopter" (Global Security) 2014). UH-72As equipped with the VIP MEP are carpeted and air conditioned (Bristol 2010, slide 24).

3. Description of UH-72A Manufacturer, EADS

This portion of Section C provides information about the manufacturer of the UH-72A helicopters, including a list of sub-contractors. It also describes the steps taken during the early stages of the manufacturing process to transfer production from

Germany, the original manufacturing site, to the United States. It further describes the effect of this transfer on the local economy.

a. Corporate Structure

The European Aeronautic Defence and Space Company N.V.[46] (EADS) is a pan-European corporation registered and headquartered in Leiden, Netherlands ("EADS" (Wikipedia) 2014). (In January 2014, EADS was reorganized as the Airbus Group, Airbus being the name of EADS' commercial airplane-making subsidiary ("EADS" (Wikipedia) 2014; "EADS to be renamed Airbus Group" (BBC News) 2013). The Airbus Group has three divisions: Airbus, Airbus Defence & Space, and Airbus Helicopters, which was formerly called Eurocopter ("EADS" (Wikipedia) 2014; "Airbus helicopters" (Wikipedia) 2014). Eurocopter (as of January 2, 2014, Airbus Helicopters) is the manufacturer of the EC-145 helicopter, from which the UH-72A helicopter was derived ("Airbus helicopters" (Wikipedia) 2014)). It is headquartered in Marignane, France, near Marseille. Its other major facility is in Donauwörth, Germany ("Airbus helicopters" (Wikipedia) 2014). Eurocopter's (now Airbus Helicopters') United States affiliate is American Eurocopter (as of February, 2014, Airbus Helicopters, Inc), which is headquartered in Grand Prairie, Texas ("The helicopter industry leader" (Airbus Helicopters' website) 2014; "Airbus Helicopters, Inc." (Wikipedia) 2014). American Eurocopter (Airbus Helicopters, Inc.) also has a major manufacturing plant in Columbus, Mississippi, which is where the UH-72A helicopters are manufactured ("Airbus Helicopters, Inc." (Wikipedia) 2014). In North America, EADS' activities are represented by EADS North America (as of January 1, 2014, rebranded as Airbus Group), which oversees Airbus Helicopters, Inc., among other subsidiaries (Airbus Group's photo gallery 2014; "Airbus Group, Inc." (Wikipedia) 2014).

b. Location of the Helicopter Manufacturing Process

The manufacture of the UH-72A helicopters at the Columbus, Mississippi facility is the result of a three-phase process to transition the helicopter manufacturing process from Eurocopter's facility in Donauwörth, Germany (Brashear 2009). This transition was completed in 2010 (EADS press release August 24, 2011, "EADS…Passes the Halfway

Mark"). Throughout the entire process, delivery and acceptance of the UH-72A helicopters took place at the Columbus facility (Brashear 2009). The transition process went smoothly, and no production delivery slots were missed during the transition (McHale 2011b; EADS feature story April 21, 2011, "The UH-72A Program: On Time, on Cost").

(1) First phase

The first phase of the transition, which concluded on 28 May 2009 with the delivery of the 70th UH-72A, was referred to as the Light Assembly Line (LAL) phase. During this phase, the helicopters were completely built and test flown in Donauwörth, Germany. They were then disassembled and shipped as a kit to Columbus. At that location, they were reassembled, painted, test flown, and delivered. The LAL phase was needed because American Eurocopter did not initially have an FAA Production Certificate[47] for the EC-145 helicopter (the civilian version of the aircraft upon which the UH-72A was based) at the Columbus, Mississippi facility (Brashear 2009). The LAL phase, which "consists of the minimum amount of production work required to qualify as a production line[,]" resulted in American Eurocopter's (now Airbus Helicopter, Inc.'s) receipt of an FAA Production Certificate for the EC-145 helicopter during the summer of 2007 (Brashear 2009 (quotation); EADS feature story August 29, 2007, "American Eurocopter Receives FAA Production Authority").

(2) Second phase

The second phase was referred to as the Full Assembly Line (FAL) phase. It ran concurrently with the LAL phase, and began in April 2008. It was scheduled to run until May 2010. The first UH-72A helicopter produced during the FAL phase was the 41st helicopter, which was delivered in September, 2008 (Brashear 2009; EADS press release October 7, 2008, "EADS…Begins Deliveries;" Forecast International 2010).[48] Forty-seven aircraft were produced during the FAL phase. During that phase, the first seven of the 15 production stages were completed in Germany; the first production stage is incoming material acceptance, and the seventh production stage is the wiring test. The helicopters were "then disassembled into a kit and shipped to Columbus[,]" Mississippi, at which location, the eighth through 15th production stages (installation of instruments and flight testing, respectively) were completed (Brashear 2009 (quotation); "EADS…Begins Deliveries").

(3) Third phase

The third phase was the Manufacturing Line (ML) phase. It ran concurrently with the first two phases and began in June 2008. The ML phase was divided into two sub-phases, Step I and Step II.

(a) Step I

The first UH-72A helicopter produced during Step I of the ML phase was the 52nd helicopter, which was delivered in December, 2008. In Step I, the first five production stages were completed in Germany; the fifth production stage was flight controls and fire walls. The helicopters were "then disassembled into a kit and shipped to Columbus[,]" Mississippi, where the sixth (wiring) through 15th production stages were completed (Brashear 2009).

(b) Step II

Step II of the ML phase began in April 2009, with the first helicopter manufactured under Step II scheduled for delivery in October 2009. In Step II, all 15 production stages took place in Columbus (Brashear 2009).[49]

c. Production Rates

From November, 2006 through August 2007, EADS delivered one UH-72A per month. In September, 2007, EADS began delivering two UH-72As per month. By early 2008, EADS was delivering three UH-72As per month; by mid-2008, sometimes four per month; and by late 2009, sometimes five per month. The production rate increases occurred according to plan (Brashear 2008a; EADS press release April 2, 2008 "EADS…Nears the 25-Delivery Milestone;" EADS feature stories June 7, 2008, "The UH-72A Comes Home" and October 5, 2009, "Building on Success"). As of June 2014, the average monthly production is three to four helicopters (Oestergaard 2014).

d. Local Economic Impact of UH-72A Manufacture

The manufacture of the UH-72A helicopters at the Columbus, Mississippi, facility has had a major impact on the local economy. By extension, this activity has also had an impact on the American industrial base.

(1) Employment

The Columbus facility began operations in 2004 employing fewer than fifty people.[50] With production of the UH-72A in full swing, the number of people employed at that facility has expanded to approximately 300 ("Production team: Overview" page of Airbus Group's UH-72A website, 2014). The shifting of the manufacturing process from Germany to the United States has resulted in a shift of the supply chain to support the U.S. manufacture (EADS feature story April 20, 2011, "The UH-72A Program: On Time, on Cost"). Within approximately two years after contract award, the production activity at the Columbus facility, including UH-72A manufacture and other manufacturing activities, was providing an estimated $36 million in contract work for some 150 vendors within the state, in addition to its own payroll, which exceeded $15 million as of December 2008 (EADS press releases December 11, 2007, "EADS…Completes a Strong Year" and June 7, 2008, "EADS…Begins UH-72A…Deliveries" and December 8, 2008, "EADS…Receives Order for 39 Additional").[51] The site's multi-million dollar payroll has thus provided an economic stimulus for Mississippi. Throughout the period of the UH-72A contract, Mississippi has had a higher unemployment rate than many other states (Bureau of Labor Statistics). The economic stimulus which the manufacture of UH-72As has provided to that state is thus a special benefit.

(2) Education

In addition to increasing the number of jobs in Mississippi, the manufacture of UH-72A helicopters at the Columbus facility has opened "ties between industry and the state's educational institutions" ("EADS…Begins UH-72A…Deliveries"). One example of these ties is a collaboration between American Eurocopter and "the East Mississippi Community College to establish training courses in the fields of electrical/avionics, sheet metal and mechanics[,]" the purpose of which was to develop a pool of "additional skilled workers from the local region" from which American Eurocopter would be able "to fill job openings over the long term" (EADS press release February 6, 2007, "EADS…Ramps-up its Production"). This pool of trained, skilled workers will be a boon to local manufacturers after the manufacture of the UH-72A helicopters is complete.

e. EADS' (Now Airbus Group's) Suppliers and Subcontractors

EADS has partnered with the following firms to manufacture the UH-72A helicopters and provide the required support services:

1. Aerolite is providing the cabin installation for the stretchers that are used in medical evacuations ("Production Team: Suppliers" page on Airbus Group's UH-72A website, 2014).

2. BAE Systems manufactures the crew and passenger seats ("Production Team: Suppliers" page on Airbus Group's UH-72A website).

3. CAE provides the cockpit procedural trainers (CPTs). These are non-motion devices which are used to train helicopter pilots to fly the UH-72As. The CPTs exactly replicate cockpit equipment, including "flight controls, instrumentation, avionics, circuit breakers and switches[,]" and "provide cockpit visuals which simulate aircraft flight" (Brashear 2008b (quotations); "Production Team: Suppliers" page on Airbus Group's UH-72A website).

4. Goodrich Corporation provides the externally-mounted rescue electric hoist for UH-72As in the MEDEVAC and S&S configurations ("Production Team: Suppliers" page on Airbus Group's UH-72A website).

5. Keith Products produces the cabin heating and ventilation systems, and also the avionics cooling system, which "ensures proper operating temperatures for the helicopter's navigation, communications and mission equipment" ("Production Team: Suppliers" page on Airbus Group's UH-72A website).

6. The NORDAM Group's Transparency Division supplies the windscreens and windows ("Production Team: Suppliers" page on Airbus Group's UH-72A website).

7. As indicated in paragraph C.2.*b*.(1) of this chapter, Sagem Avionics, Inc. provides the automatic flight control system ("Production Team: Suppliers" page on Airbus Group's UH-72A website).

8. Sikorsky provides full contractor logistical support to the active Army and partial contractor logistical support for the Army National Guard. Sikorsky's responsibilities include "maintenance contract management, supply chain management, contractor field teams, spare part and tool management, facilities management and field- and depot-level maintenance" ("Production Team: Suppliers" page on Airbus Group's UH-72A website (quotation); Brashear 2008b; Thurgood and Bristol 2010b).

9. Thales North America provides the avionics suite (the aircraft's electronics systems) ("Production Team: Suppliers" page on Airbus Group's UH-72A website; "Avionics" (Wikipedia) 2014). The avionics suite is described in paragraphs C.2.*b*.(2) of this chapter.

10. Turbomeca USA assembles the helicopter engines ("Production Team: Suppliers" page on Airbus Group's UH-72A website). These engines are described in paragraph C.2.*a* of this chapter.

11. Wulfsberg Electronics (now known as Cobham Avionics Communications) supplies the navigation and communications systems ("Production Team: Suppliers" page on Airbus Group's UH-72A website). (See paragraph C.2.*d*.(2)(g) of this chapter).

NOTES ON CHAPTER II

1. Gansler and Lucyshyn (2008) state that the cost of adding air conditioners will be "approximately $10 million" (p. 36). That information is consistent with the $14 million figure in the Tiron article.

2. According to a U.S. Department of Defense news release of April 7, 2008, only $171 million of the $209 million increase was for paying for the needed modifications. A substantial portion of the $209 million increase occurred because the total number of helicopters purchased was increased from 322 to 345. Thus, according to those figures, the increase in funds needed to pay for the modifications was really only <u>9</u>%, not 11%.

3. LTC (now COL) James Brashear was the product manager for the UH-72A acquisition program from 2006 through mid-2009.

4. Defense Acquisition University's Glossary of Defense Acquisition Acronyms and Terms (2012) defines "procurement cost" as being "[e]qual to the sum of the procurement cost for prime mission equipment, the procurement cost for support items, and the procurement cost for initial spares."

5. Selected Acquisition Report (SAR) Summary Tables as of December 31, 2006, 9

Defense Acquisition Management Information Retrieval (DAMIR), Selected Action Report (SAR) LUH as of December 31, 2011, 11, 19, 20;

SAR LUH as of December 31, 2012, 11, 19, 20.

6. SAR LUH as of December 31, 2011, 11, 19, 20; SAR LUH as of December 31, 2012, 11, 19, 20.

7. SAR Summary Tables as of September 30, 2008, 4.

8. The figures for 31 December 2009 and 30 September 2010 were identical. This information is from:

SAR Summary Tables as of December 31, 2009, 12; SAR Summary Tables as of September 30, 2010, 12.

9. All figures for 2011 and 2012 are from:

SAR LUH as of December 31, 2011, 11, 19, 20;
SAR LUH as of December 31, 2012, 11, 19, 20.

10. 2010 figures are from:

SAR LUH as of December 31, 2010, 11, 18, 19.

11. Chapter 4–5 of Army Regulation (AR) 700–142, Type Classification, Materiel Release, Fielding, and Transfer (2013), defines Full Materiel Release as "the formal certification that the materiel is safe, suitable (meets all of its performance requirements), and supportable (logistically) when used within its stated operational parameters" (p. 18).

AR 700–142 further states that FMR authorizes a program manager to allow fielding of the materiel to soldiers "on non-developmental acquisition programs or when satisfying requirements with commercial products" (p. 18).

12. FUE is defined as "[t]he scheduled date an end item and its support elements are issued to the initial operational capability unit and training in the new equipment training plan has been accomplished" (ExpertGlossary, http://www.expertglossary.com/definition/first-unit-equipped-date (direct quotation)).

13. Rick Wood's February 4, 2011 article, "Huey Takes Last Historic Ride at Yakima Training Center," quotes the U.S. Army Air Ambulance Detachment (USAAAD) Commander Maj. George Johnson as saying that as of that date, "probably less than a dozen" UH-1H aircraft were left in active duty service.

According to Mark Iacampo's May 2, 2011 article, "End of an Era: Last 'Huey' Helicopters in Active Service in Europe Retire," the last UH-1H Huey helicopters in active service in Europe were retired on April 27, 2011.

Kentavist Brackin's June 12, 2013 article, "Last AF Huey Starts New Mission with the NY Police Force," states that the Air Force's last operational UH-1H helicopter was transferred to the New York State Police's aviation unit on June 5, 2013.

14. According to Paul McCleary's and Michelle Tan's December 9, 2013 article, "Army Plans to Scrap Kiowa Helo Fleet," as of that date, the Army had 368 Kiowa helicopters remaining in service, and the Army was considering divesting itself of them.

15. Brashear, James, and Kirk Ringbloom. 2007. "UH-72A Lakota—Exceeding Expectations" (Personal Communication; draft article for *Army Aviation)*.

16. Other information sources show different dates for the issuance of the CDD.

"Light Utility Helicopter (LUH)" (08/06/2007) (GLOBAL Security) (website no longer available) showed the date as 23 September 2004.

Gansler and Lucyshyn (2008, 33–34) state that the CDD was approved in June, 2005.

Defense Acquisition Management Information Retrieval (DAMIR), Selected Action Report (SAR) LUH as of December 31, 2011 (page 8) says that the CDD is dated September 30, 2005, and that the Joint Requirements Oversight Council Memorandum, "JRCOM 216–06, dated October 18, 2006 accepted the CDD in lieu of generating a separate Capability Production Document (CPD)." (direct quotation).

17. Douglas Nelms' 2013 article, "EADS Targets U.S. Air Force as Next UH-72 Lakota Customer," shows the total number of helicopters ordered as 313.

18. The "Specifications" page shows the passenger capacity as "9;" the factsheet shows the passenger capacity as "8." Most, although not all, of the other information sources researched, including the first four listed below, show a passenger capacity of 8, not 9.

"UH-72 Lakota" on Aeroweb's website.

"UH-72 Lakota" on Military-Today.com's website.

"UH-72A Lakota Light Utility Helicopter" on Air Recognition's website.

"Quizlet."

GAO Decision B-298502 shows the seating capacity as 9.

19. Dubiel (2009) and the SAR LUH as of December 31, 2011 indicate that the UH-72A can accommodate only one, not two, medics.

20. Nelms (2009) states that the UH-72A has "dual Sagem autopilots," not a single autopilot. Since there are two articles indicating a single, not a dual, autopilot, and since one of those articles is on the website of the manufacturer, EADS (now Airbus Group), and therefore more likely to have accurate information, it is more likely that the UH-72A has a single autopilot.

21. Sagem's flight control systems control aircraft maneuvers, such as upward and downward motion and hovering, and provide for automatic piloting for such parameters as altitude and speed ("Flight Control Systems" page of Sagem's website (n.d.); Webster's New World Dictionary, 1988 (definition of terms on Sagem's website: "pitch," "roll" and "yaw")).

22. A three-axis autopilot controls an aircraft's orientation around its longitudinal, vertical, and transverse axes, as opposed to a one-axis autopilot which controls an aircraft's orientation around its longitudinal axis only, and a two-axis autopilot, which controls an aircraft's orientation around its longitudinal and vertical axes only ("Autopilot" (Wikipedia) 2014).

23. See table in paragraph C.2.*c* of this chapter and its footnote on the weight for the UH-1H.

24. See table in paragraph C.2.*c* of this chapter and its footnote on the weight for the UH-60.

25 Rotor wash is the wind that is created by rotating helicopter blades. Large helicopters can produce hurricane force winds ("What is 'rotor wash'?" on Yahoo! Answers, n.d., http://answers.yahoo.com/question/index?qid=20081204235458AApJtuS).

26. "Bell OH-58 Kiowa" (Wikipedia) 2014. (All figures corroborated by "OH-58A Kiowa" (Helis), n.d.).

27. Different information sources show widely varying figures for the weight of the UH-1H helicopter.

4899 lbs – "UH-1H Iroquois" (Helis), n.d., and "Bell UH-1 Iroquois (Huey specs)" (Homeonthenet), n.d.

5210 lbs – "Bell helicopter Bell 205 (UH-1)" (Flugzeuginfo) 2014, and "UH-1H Huey" (Olympic flight Museum) 2008.

5215 lbs – "Bell UH-1 Iroquois" (Wikipedia) 2014.*

5687 lbs – "Bell UH-1H Iroquois 'Huey' Smokey III" (Smithsonian National Air and Space Museum), n.d.

5914 lbs – Digital Combat Simulator UH-1H Huey Flight Manual, n.d., 11

* Wikipedia shows the specifications for the UH-1D. It is possible that the specifications for the UH-1H are not exactly identical to those of the UH-1D.

28. All of the above listed information sources show the length as 57 feet. Douglas Nelms' 2009 article, "Living with Lakota," states that the length of the Lakota is "roughly 57 ft."

29. Different information sources show varying figures for the height of the UH-1H helicopter.

13½ ft – Smithsonian National Air and Space Museum.

14½ ft – Helis, Flugzeuginfo, Homeonthenet, and Wikipedia.

14¾ ft – "UH-1Iroquois (Huey)" (GlobalSecurity) 2011.*

The above listed sites do not state the basis of the height measurement.

A diagram of the UH-1H on page 12 of the Digital Combat Simulator UH-1H Huey Flight Manual shows the height to the top of the main rotor as 13’ 9.74,” and the height to the top of the tail rotor as 14’ 8.20.” That could explain why four sources show the height as 14½ feet, and two other sources show the height as 13½ feet.

* GlobalSecurity.org shows the specifications for the UH-1N. It is possible that the specifications for the UH-1H are not exactly identical to those of the UH-1N.

30. Different information sources show varying figures for the engine horsepower of the UH-1H helicopter.

1100 shp – Wikipedia (UH-1D).

1134 shp – GlobalSecurity.org.

1400 shp – Flugzeuginfo.net, Helis, Homeonthenet, Olympic Flight Museum, and page 15 of the Digital Combat Simulator UH-1H Huey Flight Manual (The flight manual also shows the engine power as 1100KW. That could explain why Wikipedia shows the shp as 1100.).

Smithsonian National Air and Space Museum does not show the horsepower of the UH-1H helicopter engine.

The table in paragraph C.2.*c* of this chapter shows the 1400 shp figure only because five of the seven information sources show that figure, and one of those information sources is the flight manual, which is likely to have more accurate information than the various websites.

31. Different information sources show varying figures for the useful load capacity of the UH-1H helicopter.

3280 lbs – Wikipedia (UH-1D).

3593 lbs – Helis.

3813 lbs – Smithsonian National Air and Space Museum.

4290 lbs – Flugzeuginfo.net and Olympic Flight Museum.

4368 lbs – Page 11 of the Digital Combat Simulator UH-1H Huey Flight Manual.

Note: The useful load is the difference between the maximum gross takeoff weight and the empty weight (aircraft weight with no fuel, oil, pilot, cargo or passengers) (“Ask a Flight Instructor” http://www.askacfi.com/3565/useful-load-vs-payload.htm).

32. Different information sources show varying figures for the cruising speed of the UH-1H helicopter.

125 mph – Wikipedia (UH-1D) (Wikipedia shows the maximum speed as 135mph).

127 mph – Flugzeuginfo.net and McQueary 2007b, 16.

130 mph – Helis and Home.onthenet.com (both show the maximum speed as 148 mph).

139 mph – GlobalSecurity.org (UH-1N) (shows 139 as the speed “at sea level,” but does not indicate if 139 mph is the maximum speed or the cruising speed).

33. Different information sources show varying figures for the range of the UH-1H helicopter.

198 mi – GlobalSecurity.org (UH-1N).

260 mi – Helis.com and Home.onthenet.com.

315 mi – Wikipedia (UH-1D).

318 mi – Olympic Flight Museum.

345 mi – Flugzeuginfo.net.

The other information sources do not show the range of the UH-1H.

It is possible that some of the information sources show the range of an empty UH-1, and others show the range of a loaded UH-1. That could explain the widely varying figures for the range.

34. Different information sources show different figures for the empty weight of the UH-60L helicopter.

10,624 lbs – “Sikorsky UH-60 black hawk” (Aeroweb) 2014, and “Sikorsky UH-60 black hawk” (Wikipedia) 2014.

11,516 lbs – “UH-60 black hawk” (fas.org) 2000, and “UH-60L black hawk” (GlobalSecurity) 2011, and “UH-60L Blackhawk” (Helis), n.d.

11,519 lbs – “UH-60 black hawk” (Flugzeuginfo) 2014.

13,648 lbs – “Sikorsky UH-60 black hawk” (Combataircraft), n.d.

Notes:

I. Wikipedia, Helis.com and GlobalSecurity.org show the specifications for the UH-60L. Aeroweb.com shows the specifications for the UH-60M, not for the UH-60L. Federation of American Scientists (fas.org), Flugzeuginfo and Combataircraft do not indicate the model of the UH-60 for which they show the specifications.

II. For empty weight, engine horsepower, useful load and cruising range, the figures shown on the Combataircraft website are at greater variance with the figures shown on the other websites than the figures on the other websites are with each other. Also, although the figures on the other websites are not in total agreement, with few exceptions, for each figure shown on the other websites, there is at least one other website that shows the same figure or a closely matching (within five and a half percent) figure. The variance of the figures on the Combataircraft website with the figures on the other websites could indicate that the Combataircraft website is showing the specifications for a different model of the UH-60, or that the figures on the Combataircraft.com website for the above listed specifications are inaccurate. The table in paragraph C.2.*c* this chapter does not include Combataircraft’s figures for the listed parameters because of this variance.

III. Olympic Flight Museum and Smithsonian National Air and Space Museum do not have information on UH-60.

35. All of the above listed information sources show the length as 65 feet.

36. This information was consistent among all the listed information sources.

37. Different information sources show different figures for the engine horsepower of the UH-60L helicopter.

- 1690 shp ea - Combataircraft (model not specified)

- 1844 shp ea - Flugzeuginfo

- 1870 shp ea - Helis (UH-60L)

- 1890 shp ea - Wikipedia (UH-60L)

- 1940 hp ea - GlobalSecurity (UH-60L)

- 1994 shp ea - Aeroweb (UH-60M)

The website for Federation of American Scientists (fas.org) does not show the engine horsepower for the UH-60L.

The website of the manufacturer of the UH-60, Sikorsky (n.d.), shows the UH-60M model as having engines with 1940 shp each, which matches the information provided by GlobalSecurity.org.

38. Different information sources show varying figures for the useful load capacity of the UH-60L helicopter.

10,483 lbs – Helis and GlobalSecurity.

11,376 lbs – Aeroweb and Wikipedia.

11,980 lbs – Flugzeuginfo.

Sikorsky's website shows only the maximum weight for the UH-60.

39. All the above listed information sources show the speed of the UH-60 as 173 – 183 mph. (Not all the information sources indicated whether the speed shown was the cruising speed or the maximum speed).

Wikipedia shows the cruising speed as 173 mph and the maximum speed as 295 mph.

Sikorsky's website shows the "Maximum Cruise Speed" as 174 mph.

GlobalSecurity.com and Federation of American Scientists show the "Maximum Cruise Speed" as 175 mph at 4,000 ft., 95^{o}F; 183 mph at 2,000 ft, 70^{o}F.

Aeroweb shows the speed as 174 mph, but does not indicate if this is the cruising speed or the maximum speed.

Combataircraft.com shows 173 mph as the "Max Speed," not as the cruising speed.

Helis.com shows the cruising speed as 178 mph and the maximum speed as 224 mph.

Flugzeuginfo.net shows the "maximum cruise speed" as 175 mph and the "maximum speed" as 224 mph.

One can conclude that the cruising speed of the UH-60 is in the range of 173 – 183 mph, and that its maximum speed is most likely (two out of three information sources) 224 mph.

40. Different information sources show varying figures for the range of the UH-60L helicopter.

362 mi. – Combataircraft.

367 mi – Flugzeuginfo.

1,331 mi – Helis.com.

1,380 mi – Wikipedia.

1,381 mi – Aeroweb.

Sikorsky's website shows the range of the UH-60M helicopter as 318 miles.

The websites for Federation of American Scientists and GlobalSecurity.com do not show the range of the UH-60.

41. Alan Miller's June 5, 2013 article, "Army Aviation Unit in Grand Ledge [MI] Gets Helicopter Upgrade," states that the UH-72A's "operating cost [is] estimated at $1,250 per flight hour, compared with $7,000 for the Blackhawk helicopters…"

42. A soft keyboard (also called an "offscreen" or "software" keyboard) is a system used "on a computing device with an on-screen image map" in place of a hardware keyboard (Wong 2011).

43. Squatritro-Martin (2009) and Malone (2011) show the candlepower as 43 million.
All other information sources, including the following, show the candlepower as 30 million:

Bledsoe 2011	Bristol 2010, slide 7	Nelms 2012b	Robinson 2013
Bledsoe 2013	Gourley 2010	Orrell 2012	

"The UH-72A Makes First Flight with U.S. Army Security and Support Battalion Mission Equipment Package" (EADS press release of August 12, 2010).

One can speculate that the searchlight can provide 43 million candlepower when used with maximum wattage, and that to save power, it is seldom used with that high wattage, and that at the usual wattage at which the searchlight is used, it can provide 30 million candlepower.

44. The article refers to a demonstration of Lakota that took place at the Joint Army Readiness Center in Hohenfels, Germany, in "September of this year[.]" A September 21, 2010 EADS feature story, "The U.S. Army Showcases its UH-72A Lakota to the World" describes a demonstration of the UH-72A helicopters "earlier this month [September 2010] in Germany[.]" One can infer from the two articles that the date of the "UH-72A Lakota on European Ground" article is sometime between October and December of 2010).

45. Page 1 [dash] 10, not pages 1 through 10).

46. "N.V." stands for "naamloze vennootschap," a Dutch term whose literal translation means "nameless partnership" or "anonymous venture." It can be translated as "public limited company" or as "limited liability company" ("Naamloze vennootschap" (Wikipedia) 2014; Acronym Finder, n.d.).

47. A Production Certificate shows approval to manufacture duplicate products under an FAA-approved type design ("Airworthiness certificates overview" (Federal Aviation Administration) 2011).

48. Brashear (2009) states that the first UH-72A helicopter delivered under the FAL phase was the 44th.

The EADS press release of October 7, 2008, "EADS…Begins Deliveries," and Forecast International (2010) and "UH-72 Lakota Light Helicopter Lands Airbus in U.S. Defense Market" (Tactical Mashup (2014)) all state that the first UH-72A delivered under the FAL phase was the 41st, not the 44th.

49. The November 2010 article "The Market for Light Military Rotorcraft 2010 – 2019" states that scheduled delivery of the first helicopter manufactured entirely in Columbus, MS was mid-2010, not October 2009.

50. There is conflicting information about the initial number of employees.

EADS press release of June 7, 2008, "EADS North America Begins UH-72A Light Utility Helicopter Deliveries to the U.S. Army National Guard," shows the original number of employees as "two dozen."

The following EADS press releases and feature story show the original number of employees as "44 persons:"

(1) "EADS North America Ramps-up its Production and Deliveries of the U.S. Army's UH-72A Lakota Light Utility Helicopter," EADS press release, February 6, 2007.

(2) "American Eurocopter Receives FAA Production Authority for the U.S. Army UH-72A Lakota and EC-145 Commercial Helicopters," EADS feature story, August 29, 2007.

(3) "EADS North America Increases its UH-72A Lakota Helicopter Delivery Rate to two Aircraft per Month for the U.S. Army," EADS press release October 8, 2008.

51. The December 11, 2007 press release refers to the creation of "150 skilled jobs[,]" not to contract work for 150 vendors.

EADS April 2, 2008 press release, "EADS North America Nears the 25-Delivery Milestone for its UH-72A Lakota Light Utility Helicopter," says, "The Columbus center will generate some 250 high-value jobs at peak production, which is stimulating the Mississippi economy, opening dynamic new ties between industry and the state's educational institutions, and bringing technological capabilities to the region. Indirect employment created by EADS North America's helicopter production will also benefit Mississippi and surrounding states."

III. PROGRAM MANAGEMENT AND CONTRACTING STRATEGY

This chapter describes the acquisition process, and events that occurred during and shortly after contract award procedures.

A. PROGRAM STRATEGY

This section describes various aspects of the acquisition strategy, including the involvement of industry, the source selection strategy and process, and the selection of contract type.

1. Involvement of Industry

U.S. Army Aviation and Missile Command (AMCOM) issued a draft request for proposal (RFP), W58RGZ-05-R-0004, in late October 2004 (FedBizOpps notice October 25, 2004). This RFP requested feedback from industry on the LUH requirement itself and on the acquisition approach. As a result of industry feedback, AMCOM made extensive changes to both, which were reflected in RFP W58RGZ-05-R-0519, which was the actual solicitation for the LUH requirement (W58RGZ-05-R-0519, Section A (Supplemental Information), Executive Summary Section). By soliciting feedback from industry, AMCOM obtained information on what types of helicopters and what types of equipment were commercially available.

2. Source Selection Strategy

This portion of Section A discusses the source selection criteria and an additional aspect of the source selection process. It also discusses the fact that the acquisition was conducted using procedures applicable to the acquisition of non-commercial items, even though the item being acquired was commercially available.

a. Basis of Award

W58RGZ-06-C-0194 was awarded on the basis of best value to the government, considering the government's go/no-go criterion, which was that the helicopters have

FAA certification, and the factors Price, Technical, Producibility/Management, Logistics and Past Performance (W58RGZ-05-R-0519, Section M, paragraphs 1.1, 2.1 & 2.1.1). Of these factors, Price was more important than Technical, which was more important than Producibility/Management. Price and Technical, combined, were significantly more important than the other three factors. Of those three factors, Producibility/Management and Logistics were equal in importance, and individually they were more important than past performance. Although price was the most important factor, all the non-price factors taken together were significantly more important than price (W58RGZ-05-R-0519, Section M, paragraph 2.0).

(1) Technical factor: Critical elements and the sub-factors and their respective elements

(a) Critical elements

Within the technical factor, there were five elements which were critical (non-tradeable) requirements. Critical elements had to be satisfied in order for the proposal to be eligible for contract award. A proposal receiving an unfavorable rating for a non-critical (tradeable) element could still be considered for award (GAO decision B-298502, 2006, Section I (Background).A (Solicitation), 4th paragraph). One can speculate that the basis of determining an element to be tradeable or non-tradeable was that helicopters not meeting tradeable characteristics could still be used for their intended purposes, but helicopters not meeting non-tradeable characteristics could not be used for their intended purposes. The five critical elements were:

(i) Communication and navigation suite

The communication and navigation suite had to have network-ready communications (joint military environment and civilian agencies).

(ii) Cabin size

The cabin size had to be sufficient for two pilots and six passenger seats, when in standard mission configuration, and when in MEDEVAC configuration, sufficient to carry two patients on litters with a medical attendant and equipment.

(iii) Force protection

Force protection was defined as the capability of the crew to operate all flight controls while wearing standard protection suits.

(iv) Survivability

Survivability was defined as meeting FAA standards for crashworthy seats and fuel tanks.

(v) Performance

Performance was defined as the ability to hover out of ground effect (HOGE)[1] under sea level standard day conditions (sea level (0-feet pressure altitude (PA), no wind, 59^{o}F)) while carrying three crew members, a medical attendant, two litters with patients, all medical equipment, and sufficient fuel for 2.8 hours endurance. The assumed weight of the described load was 1,304 pounds, not including the weight of the fuel (GAO-07–406SP 2007, 129; various sections[2] of RFP W58RGZ-05-R-0519; McQueary 2007b, 3).

(b) Technical sub-factors

The Technical factor had three sub-factors which were equal in importance. These sub-factors were Avionics/Electronics, Aircraft Performance, and Physical Characteristics (W58RGZ-05-R-0519, paragraph M.2.3).

(i) Avionics/Electronics had six elements, including the critical element of network-ready communications. The other five elements were, in descending order of importance: systems operability, image intensification compatibility, intercommunications system (between crew and passengers), electromagnetic vulnerability,[3] and cockpit voice recorder (CVR)/Flight Data Recorder (FDR) (W58RGZ-05-R-0519, paragraph M.2.3.1; W58RGZ-05-R-0519 statement of work (SOW) paragraph A.2.1.4).

(ii) Aircraft Performance had ten elements, including the critical element of performance (HOGE at sea level with no wind at 59^{o}F). The other nine elements were, in descending order of importance, endurance,[4] internal and external load,[5] autorotation,[6] operational range,[7] handling qualities, cruise airspeed, fuel compatibility, operational environment,[8] and start-up timeline (W58RGZ-05-R-0519, paragraph M.2.3.2).

(iii) Physical Characteristics had twelve elements, including the other three critical elements, cabin size, force protection and survivability, in descending order of importance. Six of the other nine elements included, in descending order of importance, hoist, wire strike protection,[9] system growth potential,[10] open port and pressure refueling,[11] human factors engineering,[12] and crew equipment storage (W58RGZ-05-R-0519, Section M, paragraphs 2.3, 2.3.1, 2.3.2, and 2.3.3).

(2) Non-technical factors and their sub-factors

The non-technical factors were Price, Producibility/Management, Logistics, and Past performance. Their respective sub-factors were as follows:

(a) Price

Price had two sub-factors: Total Production Price, and Total Operations and Support Price, which were added together to derive a total price (W58RGZ-05-R-0519, Section M, paragraph 2.2).

(b) Producibility/Management

Producibility/Management had two sub-factors: in order of importance, Producibility/Manufacturing and Management (W58RGZ-05-R-0519, Section M, paragraph 2.4).

(c) Logistics

Logistics had four sub-factors, which were:

(i) Logistics Support Approach, which was significantly more important than the other sub-factors, Reliability, Availability and Maintenance (RAM), and Training Approach, and Other Support Approaches.

(ii) RAM, which was equal in importance to Training Approach, and when combined with Training Approach, was more important than Other Support Approaches.

(iii) Training approach, the level of importance of which is described in the "RAM" paragraph.

(iv) Other Support Approaches (W58RGZ-05-R-0519, Section M, paragraph 2.5) included, but were not limited to, Over & Above Maintenance, Procedural Training Support, and Engineering Services.

(d) Past performance

Past Performance had four elements: Quality of Performance, Schedule Compliance, Business Relations, and Financial/Cost Management (W58RGZ-05-R-0519, Section M, paragraph 2.6.4).

b. Requirement for Offerors to Submit a Helicopter for Source Selection Performance Demonstration (SSPD)

The offerors determined to be in the competitive range based on thorough evaluation of their submitted written proposals were required to participate in the SSPD as a condition for award. The purpose of the SSPD was to verify that the helicopter that each offeror proposed to supply matched the description of that helicopter stated in the offeror's proposal (W58RGZ-05-R-0519, Section L, paragraph 2.4.1; Section M, paragraph 1.2; Attachment 4 to RFP, "Source Selection Performance Demonstration (SSPD)," paragraph 1).

The SSPD was conducted at Fort Rucker, located in southern Alabama, in February and March of 2006 (McQueary 2007b, 5; Attachment 4 to RFP, paragraph 1.1; "Ft. Rucker" (Wikipedia) 2014). It consisted of operation and evaluation of the proposed helicopters by experienced government experimental test pilots, government personnel's observation and recording of helicopter maintenance, and "physical inventory" by government personnel "of all major components and mission equipment installed on each" offeror's proposed helicopter "to identify variations from the configuration list provided in" each offeror's proposal (RFP Attachment 4, paragraph 1).

For the SSPD, each offeror was required to provide ground and flight training for the government crews participating in SSPD (RFP Attachment 4, paragraph 1.3). Upon or before arrival at the SSPD, each offeror also was required to "provide, for Government review, all aircraft documentation required to prove airworthiness" of each proposed helicopter (RFP Attachment 4, paragraph 1.4 (quotation); RFP Section L, paragraph 2.4.1). The required documentation, included, but was not limited to, the Airworthiness Certificate[13] (RFP Attachment 4, paragraph 1.4; RFP Section L, paragraph 2.4.1).

The SSPD included demonstration and evaluation of the five critical elements and of all the non-critical technical elements listed above in paragraph 2.*a*.(1) of this Section III.A (RFP Attachment 4 (SSPD), paragraphs 1.12–1.27). RAM was evaluated by the government "monitoring and recording all of the…aircraft maintenance, service and support activities" on each offeror's aircraft (RFP Attachment 4, paragraph 1.29). Each time an offeror performed "a maintenance check or service to the aircraft," the offeror was required to notify the government, and then the government monitored and recorded the activity (RFP Attachment 4, paragraph 1.29). The recorded data included the type of "service or maintenance performed and [the amount of] time required to complete the effort" (RFP Attachment 4, paragraph 1.29).

One would expect that in addition to providing the buying activity the opportunity to verify that each offeror's proposed helicopter had all the capabilities and characteristics described in the offeror's written proposal, the SSPD would or might also reveal problems, or potential problems, with the proposed aircraft, specifically, problems that could be identified only through hands-on use of that aircraft. As discussed in paragraph C.1 of this chapter, however, the SSPD failed to reveal several problems with the UH-72A helicopters.

c. Use of Federal Acquisition Regulation (FAR) Part 15 Procedures, rather than FAR Part 12 Procedures, even though the LUHs are Commercial Items

Federal agencies usually acquire commercial items using the procedures stipulated in FAR Part 12, Acquisition of Commercial Items. The acquisition procedures that FAR Part 12 stipulates for such acquisitions are simpler and more streamlined than the acquisition procedures required by FAR Part 15, Contracting by Negotiation, for acquisition of non-commercial items. For example, FAR Part 12 requires the inclusion of far fewer contract clauses.

One can speculate that the reasons for AMCOM acquiring the LUHs using FAR Part 15 procedures, even though AMCOM could have followed the simpler FAR Part 12 procedures for acquisition of commercial items, are as follows:

(1) Government quality assurance procedures

The Statement of Work (SOW) for the LUHs requires more extensive government quality assurance procedures prior to product acceptance than are usually applicable to commercial items.

FAR 12.208 requires that "[c]ontracts for commercial items rely on contractors' existing quality assurance systems" in lieu of "Government inspection and testing before" submission "for acceptance, unless customary market practices for the commercial item being acquired include in-process inspection." By contrast, the SOW for the LUHs requires that as part of the acceptance procedure for each aircraft, Defense Contract Management Agency (DCMA) representatives will conduct a Government Acceptance Test Procedure (GATP) "that will include a limited verification of delivered aircraft equipment against the Performance Specification and Configuration List" (RFP SOW paragraph 3.2.8.1). Also, although acquisitions conducted using FAR Part 12 procedures can involve DCMA monitoring of contractor performance after contract award, such involvement is unusual for such acquisitions.

(2) DCMA involvement in Pre-Award Survey

To verify and finalize evaluation of the offerors' proposals, the solicitation required offerors to "accommodate DCMA in conducting a Pre-Award Survey at their production facilities as determined necessary by the Government" (RFP Section M, paragraph 1.5). As for monitoring of post-award contractor performance, although acquisition by use of FAR Part 12 procedures does not preclude conducting a pre-award survey by a government agency, such activity is unusual for such acquisitions.

(3) Extensive pre-award testing of purchased commodity

As discussed in paragraph A.2.*b* of this chapter, comprehensive flight testing of the helicopters was required as part of the proposal evaluation process. Although acquisition of commercial items does occasionally require that the article being acquired undergo such hands-on use and testing as part of its evaluation for award, this degree of pre-award testing is unusual for the acquisition of commercial items. The responsible contracting officer may have decided that the degree of testing required made FAR Part 15 acquisition procedures more appropriate than FAR Part 12 acquisition procedures.

(4) Complexity of the purchased commodity

The Statement of Work and the list of Evaluation Criteria were very long and very detailed. Although the LUH is a commercial item, the contracting officer may have decided that because of the complexity of the item, and the voluminous detail of the requirements for the helicopters themselves and the support and other services required, and the highly detailed evaluation criteria, acquisition by FAR Part 15 procedures was more appropriate than acquisition by FAR Part 12 procedures.

3. Source Selection Process

This portion of Section A describes the basis of the source selection decision and the two GAO protests against that decision.

a. The Offers Received and their Ratings

Five offerors responded to W58RGZ-05-R-0519. Four of the submitted proposals were included in the competitive range, with the offered aircraft participating in the SSPD (GAO Decision B-298502, 2006, Section I (Background).B (Evaluation)). All four offerors whose aircraft participated in the SSPD remained in the competitive range at the conclusion of that event (GAO Decision B-298502, Section I.B).[14] The offerors whose proposed aircraft were included in the SSPD are listed in Table 2. The offerors' overall ratings for the Technical factor, and ratings for the five critical (non-tradeable) evaluation elements, are shown in Table 3. The basis for the technical ratings is shown in Table 4.

Table 2. List of offerors whose proposed helicopters participated in the SSPD.

Offeror	Offered Helicopter	Price
Bell Textron	Bell 210	
Bell Textron	Bell 412 EP Twin "Huey"	
MD Helicopters, Inc. (MDHI)	MD 900 Explorer	$4,251,356,442
AgustaWestland, Inc. (AWI)	U.S. 139	$4,747,162,454
EADS	EC-145	$3,880,000,723

Notes on Table 2:

1. The author could not locate information on the proposed prices for the two helicopters offered by Bell Textron, the Bell 210, and the Bell 412 EP Twin "Huey." Therefore, Table 2 does not show that information.

2. The information in the middle column of Table 2 is from "LUH - Eurocopter UH-72A Lakota," (n.d.) on http://www.helis.com/programs/luh.php.

3. The information in the rightmost column of Table 2 is from GAO Decision B-298502, 2006, Section I (Background). B (Evaluation), Table 1.

Table 3. Technical and risk ratings for MDHI, AWI and EADS for the five critical elements.

	MDHI	AWI	EADS
Technical	Marginal/High Risk	Good/Low Risk	Satisfactory/Low Risk
Communication and Navigation Suite	Good	Satisfactory	Satisfactory
Cabin Size	Satisfactory	Excellent	Excellent
Force Protection	Excellent	Excellent	Good
Survivability	Satisfactory	Good	Good
Performance	Satisfactory	Excellent	Excellent

Note on Table 3:

The information in Table 3 is from GAO Decision B-298502, 2006, Section I (Background).B (Evaluation), Tables 1 and 2.

Table 4. Numbers of technical evaluation elements exceeded and not met by each proposal.

	Critical Elements Exceeded	Tradeable Elements Exceeded	Tradeable Elements Not Met
MDHI	2	4	8
AWI	4	10	2
EADS	4	5	5

Notes on Table 4:

1. All three proposals met or exceeded each critical element. Therefore, Table 4 does not include a "Critical Elements Not Met" column.

2. The information in Table 4 is from GAO Decision B-298502, Section I.B, Tables 1 and 2.

(1) MDHI's proposal

(a) Technical factor

MDHI's proposed helicopter received a "Marginal" technical rating because it exceeded the threshold requirements for only two of the critical elements and for only four of the tradeable elements (Intercommunications System, Fuel Compatibility, Wire Strike Protection, and Human Factors Engineering). In addition, MDHI's helicopter failed to meet threshold requirements for eight other tradeable elements (CVR/FDR, Endurance, Internal/External Loads, Cruise Airspeed, Operational Environment, Startup Timeline, System Growth Potential, and Open Port and Pressure Refueling). MDHI's proposal received a high risk rating for the Technical factor because the proposed aircraft had five incomplete FAA certifications and MDHI did not provide adequate information to support certification by time of first delivery of aircraft and also did not provide information regarding radio certification. Also, the cabin size was small, and "it appeared that medical equipment stowage could interfere with litter loading" (GAO Decision B-298502, Section I.C (Source Selection Decision) (quotation); Section I.B, Tables 1 & 2).

(b) Producibility/Management and Past Performance factors

In addition to the "Marginal" Technical rating, MDHI's proposal received a "Marginal/High Risk" rating for the Producibility/Management factor and a "Moderate

Risk" rating for Past Performance. The former rating was based on the fact that MDHI had not produced significant quantities of its proposed aircraft since 2001, approximately five years prior to its proposal submission, and because there were inconsistencies between its proposed manufacturing plan and integrated master schedule; further, these documents did not support the proposed production schedule. The latter rating was because MDHI had previously had problems with financial and cost management which had resulted in difficulties meeting delivery schedules and in problems with vendors. Even though "Patriarch Partners, LLC had acquired a controlling interest in MDHI in July 2005," with resultant financial and management improvements, including improved vendor relationships and customer service, MDHI still lacked a strong vendor base (all of the proposed vendors were single sources), and that lack posed "moderate risk to successful completion of the LUH requirements" (GAO Decision B-298502, Section I.C (Source Selection Decision) (quotation); Section I.B, Tables 1 & 2; Section II (Analysis).B (P/M Factor).2 (MDHI's Protest Grounds)).

(c) Contracting officer's overall evaluation of MDHI's proposal

In consideration of the "Marginal/High Risk" ratings for the Technical and Producibility/Management factors and the "Moderate Risk" rating for Past Performance, the SSA concluded that MDHI's proposal did not provide the best value to the government (GAO Decision B-298502, Section I.C).

(2) AWI's and EADS' proposals

By contrast, the helicopters proposed by EADS and AWI <u>exceeded</u> the threshold requirements for <u>four</u> of the five <u>critical</u> elements, receiving, respectively, two and three "Excellent" ratings for critical elements. Both proposals received "Good/Low Risk" ratings for the Producibility/Management factor and "Low Risk" ratings for Past Performance. These ratings were based on the fact that both EADS and AWI "were mature, proven manufacturers," and they were offering aircraft already in production (GAO Decision B-298502, Section I.C). Also, both provided "convincing production planning information" that supported their respective abilities "to produce aircraft at the rates desired by the Government" (GAO Decision B-298502, Section I.C).

(a) AWI's proposal

AWI's proposed helicopter <u>exceeded</u> the threshold requirements for <u>ten</u> of the 23 tradeable elements (Image Intensification Compatibility, Intercommunications System, Endurance, Internal/External Loads, Operational Range, Handling Qualities, Cruise Airspeed, Fuel Compatibility, System Growth Potential, and Crew Equipment Storage); received an "Excellent" rating for Endurance, Operational Range, Cruise Airspeed, and System Growth Potential; and a "Good" rating for the other six listed elements. It <u>failed to meet threshold requirements</u> for only <u>two</u> tradeable elements, Operational Environment and Startup Timeline.

(b) EADS' proposal

EADS' proposed helicopter <u>exceeded</u> the threshold requirements for <u>five</u> of the tradeable elements (Image Intensification Capability, Operational Range, Cruise Airspeed, Fuel Compatibility, and System Growth Potential); received an "Excellent" rating for Operational Range and System Growth Potential; and received a "Good" rating for the other three listed elements. It <u>failed to meet threshold requirements</u> for <u>five</u> tradeable elements (CVR/FDR, Internal/External Loads, Operational Environment, Startup Timeline, and Open Port and Pressure Refueling) (GAO Decision B-298502, Section I.B, Tables 1 & 2).

(3) Source Selection Decision

Although the helicopter proposed by AWI was technically superior, the Source Selection Authority (SSA) awarded the contract to EADS. The SSA made this decision because AWI's price exceeded EADS' price by over $867 million, a difference of approximately 20%, and the SSA saw no "significant benefit to the Government in paying" that much more money for a helicopter that exceeded the government's requirements over a helicopter that satisfactorily met the requirements (GAO Decision B-298502, Section I.C). The SSA's decision stated that there was "no convincing argument" that the technical superiority of AWI's helicopter would provide "significantly greater benefit to the Army for the intended light utility mission than the lower priced, but technically satisfactory, aircraft offered by EADS" (GAO Decision B-298502, Section I.C). The SSA's decision "considered the mission impact of three" of the tradeable elements for which EADS' proposed helicopter failed to meet—and AWI's proposed helicopter did meet—threshold requirements, CVR/FDR, Internal/External Loads, and Open Port and Pressure Refueling, and the SSA concluded that EADS' proposed helicopter's failure to meet these requirements would not hinder the aircraft's ability to perform the intended mission (GAO Decision B-298502, Section I.C). The SSA based this conclusion, in part, on extensive questioning of the evaluators, some of whom "were experienced aviators or were experts in their field of evaluation[.]" (GAO Decision B-298502, Section I.B). Based on the evaluators' responses, the SSA was convinced that EADS' proposed helicopter would "adequately meet the mission needs of the LUH users[,]" despite its failure to meet the threshold requirements for several tradeable elements (GAO Decision B-298502, Footnote 11 (quotation); Section I.B).

(4) Documentation of the Source Selection Decision

The evaluation documentation supporting the source selection decision was very extensive and very detailed (GAO Decision B-298502, Section II (Analysis).A (Technical Factor).1 (AWI's Protest Grounds)). The thoroughness of the source selection documentation enabled AMCOM to successfully withstand protests from two unsuccessful offerors.

(a) Documentation of price evaluation

The Price Negotiation Memorandum (PNM) was 132 pages long, and it had eight attachments. It was supported by a 39-page price analysis report and other documentation. The PNM together with its supporting documentation showed that AMCOM "conducted a detailed, thorough analysis of each offeror's proposed price, including the overall price and the price for each of" several components of the overall price (GAO Decision B-298502, Section II.D (Price Factor)). The documentation discussed the strengths and weaknesses of each offeror's pricing approach (GAO Decision B-298502, Section II.D).

(b) Documentation of evaluation of non-price factors

The Source Selection Evaluation Board (SSEB) report was over 1,000 pages long. It consisted of the "roll-ups" of each element, sub-factor, factor, and the underlying evaluator comments (GAO Decision B-298502, Footnote 6). These "roll-ups" represented the composite ratings based on all the evaluators' ratings for each element, sub-factor, and factor. In addition to the SSEB report, "[t]he SSA was presented with a comprehensive series of power point slides" which summarized the evaluation, and "with a detailed chart…that identified the SOW's threshold requirements for each of the technical elements [listed in part in paragraph A.2.*a*.(1) of this chapter] and each offeror's capability with regard to that element, as a means of comparing the offeror's [*sic*] proposals to each other and to the SOW requirement" (GAO Decision B-298502, Section I.B). The SSA also received summary charts which identified "key characteristics, or aircraft attributes, of each proposal and a list of airframe features" (GAO Decision B-298502, Section I.B).

b. The Two Protests of the Award of the LUH Requirement to EADS

MDHI, which offered a technically inferior, higher priced helicopter than the EC-145 offered by EADS, and AWI who offered a technically superior, higher priced helicopter, both protested the award of the LUH requirement to EADS. GAO denied both protests (GAO Decision B-298502, Digest).

Both protesters alleged that their respective proposals were rated too low or were rated too low in comparison with the ratings given to the EADS proposal, or that the EADS proposal was rated too high in comparison to their proposals. MDHI additionally alleged that its low ratings for the Technical, Producibility/Management, and Past Performance factors, as discussed in paragraphs A.3.*a*.(1)(a) & (b) of this chapter, were undeserved. AWI additionally alleged that its proposal did not receive enough credit for the technical superiority of its offered helicopter over EADS' offered helicopter (GAO Decision B-298502, Section II). GAO found that the source selection decision and its supporting documentation showed that each contention of each protester was without merit.

(1) MDHI’s protest

(a) GAO found that the source selection documentation showed that the low ratings assigned to MDHI’s proposal were reasonable for the reasons stated in paragraph A.3.*a*.(1) of this chapter. GAO further found that the documentation adequately supported the source selection decision that MDHI’s proposed helicopter was technically inferior (and that it was more than $371 million higher than EADS’ helicopter); thus, MDHI’s proposal did not provide the best value to the Government (GAO Decision B-298502, Section II.A (Technical Factor).2 (MDHI’s Protest Grounds); Section II.B (P/M Factor).2 (MDHI’s Protest Grounds); Section II.C (Past Performance Factor)).

(b) GAO also found meritless MDHI’s contention that its proposal was evaluated unfairly compared with the way EADS’ proposal was evaluated. MDHI’s allegation was based on its perception that for several tradeable elements, both MDHI and EADS failed to meet threshold requirements for those elements, but EADS received higher ratings than MDHI for the sub-factors that included those elements. The source selection documentation showed that for each of those elements, the evaluation resulted in one of two outcomes: Either a) MDHI and EADS actually received the same rating for the sub-factor, or b) if MDHI received a lower rating for the sub-factor, MDHI’s lower rating was based on the fact that it received lower ratings than EADS for several other elements comprising that sub-factor. The source selection documentation thus refuted MDHI’s allegation that proposal evaluation was biased in favor of EADS (GAO Decision B-298502, Section II.A.2, paragraphs a (Internal/External Load), b (Open Port and Pressure Refueling), and c (CVR/FDR)).

(2) AWI’s protest

(a) AWI’s allegation that its proposal was rated too low

AWI contended that its proposal should have received an “Excellent” rating, instead of a “Satisfactory” rating, for the element Configuration Management Approach, an element of the Management sub-factor of the Producibility/Management factor. AWI’s position was that its proposed approach for reviewing change requests merited an “Excellent” rating for this element. AWI’s contention did not consider the fact that the Configuration Management Approach element included several other considerations. These other considerations were the MEDEVAC kits, hoist kits, and painting and marking. AWI only met, and did not exceed, the requirements for these other elements. GAO therefore found that the agency had reasonably assigned a “Satisfactory” rating, rather than an "Excellent" rating, to AWI's proposal for the Configuration Management Approach element (GAO Decision B-298502, Section II.B (P/M Factor).1 (AWI's Protest Grounds); RFP Section L, paragraph 2.5.2; RFP Section M, paragraph 2.4.2.2; & SOW paragraphs 3.1.7 (Configuration Management Program), 3.2.6–3.2.6.2 (MEDEVAC kits (A & B)), 3.2.7–3.2.7.2 (Hoist kits (A & B)), 3.2.12.1 (Painting), and 3.2.12.2 (Marking)).

(b) AWI's allegation that EADS' proposal was rated too high

AWI contended that EADS' proposal did not merit the "Low Risk" rating it received for the Technical factor. AWI based its contention, in part, on the fact that EADS' proposed helicopter failed to meet threshold requirements for several tradeable elements and had crashed twice (GAO Decision B-298502, Section II.A.1 (AWI's Protest Grounds).f (Technical Risk)).

(i) EADS' proposed helicopter's failure to meet tradeable elements

The source selection documentation showed that for two of the tradeable elements for which EADS' proposed helicopter failed to meet threshold requirements, Operational Environment and Startup Timeline, AWI's proposed helicopter also failed to meet threshold requirements (GAO Decision B-298502, Section I.B, Table 1). Also, those two elements were the least important elements under the Aircraft Performance sub-factor (GAO Decision B-298502, Section II.A.1.f; RFP Section M, paragraph 2.3.2). For the three tradeable elements for which EADS' proposed helicopter failed to meet threshold requirements, but AWI's proposed helicopter met or exceeded the requirements (CVR/FDR, Internal/External Loads, and Open Port and Pressure Refueling), as discussed in paragraph A.3.*a*.(3) of this chapter, the source selection documentation showed that the failure of EADS's proposed helicopter to meet these requirements was judged to have little impact on the helicopter's ability to meet mission requirements. GAO thus found that the source selection authority reasonably concluded that the failure of EADS' proposed helicopter to meet threshold requirements for five tradeable elements did not warrant EADS' proposal receiving other than a "Low Risk" rating (GAO Decision B-298502, Section II.A.1.f).

(ii) Crashes of EADS' offered helicopter

On June 21, 2006, after receipt of final proposal revisions, the agency became aware of a report of two crashes of EC/UH-145 helicopters in the Pyrenees in Southern France. AWI cited this report as evidence that EADS' proposed helicopter did not deserve a "Low Risk" rating. The government conducted an investigation, and the LUH project manager performed an internal review. Shortly after publication of the report, French aviation officials announced that they were withdrawing plans to impose restrictions because the crashes had been determined to have been caused by weather conditions, not by aircraft malfunction. The agency's investigation included querying the FAA about the two crashes. FAA was not aware of any restrictions or limitations placed on the EC/UH 145 helicopters either at that time or previously. Based on the findings of the French aviation officials, and because of the agency's thorough investigation, GAO found "no basis to challenge the agency's conclusion that EADS's aircraft presented low technical risk" (GAO Decision B-298502, Section II.A.1.f).

(iii) AWI's allegation that the technical superiority of its proposal did not receive adequate credit

The source selection documentation showed that for each element for which AWI's proposed helicopter was superior to that of EADS, the evaluation resulted in one of two outcomes: Either a) AWI's helicopter received a higher rating than EADS' helicopter, or b) for elements for which both helicopters received an "Excellent" rating, the technical superiority of AWI's helicopter was noted, but it was determined to provide no value to the mission. For those elements, the source selection documentation demonstrated that the capability of EADS' helicopter exceeded expected mission requirements, and therefore, the additional capability of AWI's helicopter was of no value to the agency. The source selection documentation thus refuted AWI's allegation of insufficient credit being given for the technical superiority of its helicopter (GAO Decision B-298502, Section II.A.1 & sub-paragraphs; Footnotes 18 & 19).

(3) Summary of GAO's findings

GAO found that the voluminous detail of the source selection documentation was not only sufficient to refute all contentions of both protesters, but it also clearly demonstrated that the source selection authority had made a reasonable decision to award the LUH requirement to EADS. The thoroughness of the source selection officials' documentation provided GAO with a sound basis to dismiss both protests. GAO found no valid basis for any of the contentions of either protester.

4. Contract Type

The contract W58RGZ-06-C-0194 is basically a firm-fixed-price contract with economic price adjustment (FFP-EPA). The contract has a base period and 10 option years. The contract includes the FAR clause 52.216–4, Economic Price Adjustment—Labor and Material, but does not include any other FAR Part 16 clauses. W58RGZ-06-C-0194 is not strictly an FFP-EPA contract. The offer schedule does have, for the base period and for each option period, a time-and-material line item for engineering services (firm-fixed-price per hour, estimated 1,000 hours per year) and a cost-reimbursable line item for travel and materials.

The contract calls for firm-fixed-prices for the aircraft itself and for auxiliary equipment such as Medvac B-Kits and Hoist B-Kits, and for full contractor logistics support, depot maintenance, and training (RFP W58RGZ-05–0519, Section B).

Fixed price contracts maximize the contractor's incentive to control costs and perform effectively, and impose a minimum administrative burden upon the contracting parties (Federal Acquisition Regulation (FAR) 16.202–1). Fixed price contracts are appropriate for the acquisition of commercial items and for other supplies and services that have well defined requirements (FAR 16.202–2). Since the LUHs are commercial items and the specifications for the production of the helicopters themselves and for the supporting services are clear and well-defined, a fixed-price contract is the appropriate contract type for this acquisition. Since it is quite plausible that costs of raw materials could fluctuate over the total 11-year contract period, use of a firm-fixed-price contract with economic price adjustment is appropriate. Since the exact number of hours of engineering services and the exact amount of travel costs, and the actual amounts and types of materials used for maintenance and training could not be known in advance, use of time-and-materials and cost-reimbursement line items for these expenses is appropriate.

B. BUDGET AND FINANCE:

1. Budgeted amounts for LUHs for Fiscal Year's 2005–2014 from Department of Defense Budget for Procurement (P-1) Programs

The Procurement appropriation funding the LUH acquisition is 2031A, Aircraft Procurement, Army. The budgeted amounts, in millions of dollars, are shown in Table 5.

Table 5. Budgeted dollar amounts by Fiscal Year for UH-72A acquisition

Fiscal Year	Number of Helicopters	Dollar Amount ($ million)	Funds for Utility Helicopter Modifications[15] ($ million)
2005	0	$2.0	
2006	16	$88.7	
2007	26	$148.4	$67.8
2008	42 or 43[16]	$228.9	$24.7[17]
2009	44	$256.4[18]	$27.0[19]
2010	54	$325.2[20]	$88.6[21]
2011	50	$305.3[22]	$77.6[23]
2012	39	$250.4[24]	$74.7[25]
2013	34	$272.0	$73.8
2014	10	$ 96.2[26]	$74.1

The sources for the figures in this table are as follows:

2005–2006: Department of the Army Procurement Programs, Committee Staff Procurement Backup Book, Fiscal Year (FY) 2008/2009 Budget Submission, Aircraft Procurement, Army, Exhibit P-40, Budget Item Justification Sheet, February 2007

2007–2008: Department of Defense Budget, Fiscal Year 2009, Procurement (P-1) Programs, published by the Office of the Under Secretary of Defense (Comptroller), February 2008, A-3, A-4

2009: Department of Defense Budget for Fiscal Year 2010, Procurement (P-1) Programs, published by the Office of the Under Secretary of Defense (Comptroller), May 2009, A-3, A-5

2010: Department of Defense Budget, Fiscal Year 2011, Procurement (P-1) Programs, published by the Office of the Under Secretary of Defense (Comptroller), February 2010, A-3, A-4

2011: Department of Defense Budget, Fiscal Year 2012, Procurement (P-1) Programs, published by the Office of the Under Secretary of Defense (Comptroller), February 2011, A-3, A-5

2012: Department of Defense Budget, Fiscal Year 2013, Procurement (P-1) Programs, published by the Office of the Under Secretary of Defense (Comptroller), February 2012, A-3A, A-4

2013–2014: Department of Defense Budget, Fiscal Year 2014, Procurement (P-1) Programs, published by the Office of the Under Secretary of Defense (Comptroller), April 2013, A-3, A-3A, A-4, A-4A

C. TEST AND EVALUATION

This section of this chapter describes the failure of the pre-award source selection performance demonstration to reveal problems which later became apparent during Initial Operational Test and Evaluation (IOTE) and during initial deployment of the helicopters. It further describes the nature of these problems. Additionally, this section discusses positive attributes of the UH-72A helicopters which were highlighted in the IOTE report.

1. Results of Source Selection Performance Demonstration

As stated in paragraph A.3.*a* of this chapter, none of the four offerors whose offered aircraft participated in the SSPD was eliminated from competition as a result of said participation. The SSPD thus demonstrated to the satisfaction of the evaluators that the aircraft that each of those four offerors proposed to supply matched the description of the proposed helicopter stated in each of those offerors' proposals.

Although the SSPD provided adequate verification of the offerors' descriptions of their proposed helicopters, as stated in paragraph A.2.*b* of this chapter, the SSPD failed to reveal several later-identified problems with the selected helicopter, EADS' UH-72A. These problems were:

1. The tendency of the helicopter cabin and cockpit to overheat, even at moderate ambient temperatures

2. Lack of sufficient space in the MEDEVAC configuration to allow for a medic to provide treatment to two evacuees on litters

3. Sand and dust being ingested into the helicopter engines

The first two problems were revealed during IOTE, which began in March 2007 and was conducted at the National Training Center (NTC) at Fort Irwin, California, located in the Mojave Desert (McQueary 2007b, i-ii, 6; "Fort Irwin National Training Center" (Wikipedia) 2014). The third problem was revealed somewhat later (after initial deployment of the Lakotas to the NTC) when preliminary findings concerning an engine fire indicated the ingestion of foreign objects (McQueary 2007b, 22).

During IOTE, “[c]ockpit and cabin temperatures, on average, reached 15.6 and 11.2 degrees Fahrenheit, respectively, above the outside air temperatures” (McQueary 2007b, 17). During one IOTE mission, the cockpit temperature rose to 104.9^{o}F when the outside air temperature was only 80^{o}F, an increase of 24.9^{o}F. When outside temperatures were moderate, in the range of 50^{o}F to 60^{o}F, on the average, cockpit temperatures rose 10 degrees above the outside air temperature (McQueary 2007b, 17–18). During the SSPD, the government evaluators did not observe cabin and cockpit temperature increases of the magnitudes observed during the IOTE. Since both the SSPD and the IOTE took place in the February–March timeframe, and because ambient temperatures both in the Fort Rucker and Fort Irwin vicinities are comparable at that time of year, and at both locations are generally in the range in which the temperature increases were observed during IOTE,[27] one would not expect a large discrepancy in the degree of cabin and cockpit temperature increases observed during the two events. One can speculate that during SSPD, there may have been cloud cover, which would limit the extent to which the temperature in the helicopter cabin and cockpit would increase, while during IOTE, which was conducted in a desert environment, it is likely that the sky was cloudless, thereby allowing more sunlight to penetrate the cabin and cockpit, with a consequent greater magnitude of temperature increase. One can further speculate that the SSPD for the UH-72As may have been conducted on a day that was cooler than average for that time of year.

It is difficult to speculate on why the SSPD did not reveal the problem of insufficient space in the MEDEVAC configuration to allow a medic to provide treatment to two evacuees on litters. (In fact, the proposed helicopters were rated “Excellent” with respect to the “Cabin Size” element of the evaluation criteria, based on the capacity for nine seats in the standard (non-MEDEVAC) configuration (GAO Decision B-298502, Section II (Analysis).A (Technical Factor).1 (AWI’s Protest Grounds).c (Cabin Size) [28])).

It is likely that the problem of sand and dust ingestion by the helicopter engines was not observed during SSPD because Fort Rucker is not located in a dusty or sandy environment. The vicinity of Fort Rucker includes forests (both dry and moist), fields, flood plains, and swamps (Dransfield and Woods 2004). By contrast, Fort Irwin is located in the Mojave Desert. A desert environment has a great deal of sand and dust.

2. Results of Initial Operational Test and Evaluation (IOTE)

In March 2007, the Army conducted the IOTE in accordance with the Director of Operational Test and Evaluation (DOT&E)-approved Test and Evaluation Master Plan (TEMP) and test plan (McQueary 2007b, i, 5, 6). The report on the IOTE stated the following:

a. Operational Effectiveness[29]

Except as described next, the UH-72A helicopters were operationally effective. The three UH-72As used for the IOTE successfully completed 14 out of 18 difficult light utility helicopter missions that were conducted in realistic operating scenarios, including both day and night conditions. The 18 missions included medical evacuation, aerial sustainment (external lift), passenger transportation, search and rescue, and response team insertion, which involved the wearing of nuclear, biological, and chemical warrior garments by passengers and crew (McQueary 2007b, ii, 6, 10). Of the four unsuccessful missions, two were medical evacuation missions, and two were aerial sustainment missions.

(1) Unsuccessful medical missions

The two unsuccessful medical missions failed because of insufficient space in the helicopter to accommodate two patients on litters and a medic to treat them. (There were only six and one half inches between the two litters).

(a) These two unsuccessful missions also revealed the following:

1. The cabins lacked ceiling rails for hanging intravenous lines and for storing and securing equipment.

2. Insufficient cabin lighting and external lighting at the rear of the aircraft hindered nighttime medical evacuation missions (McQueary 2007b, ii, 12).

(b) To address the above described performance shortfalls, the IOTE report recommended the following:

1. Reconfiguration or modification of the cabin to provide more space for the medic and medical evacuation equipment when the cabin is carrying two litters;

2. Installation provisions for cabin ceiling rails from which intravenous lines could be hung and for use in storing and securing medical equipment;

3. Additional lighting for illuminating the tail rotor and rear doors (McQueary 2007b, iii, 27).

(2) Successful medical evacuation missions

The IOTE also included three medical evacuation missions that were successful. These three missions showed that the UH-72A helicopters could be used to transport:

1. A single patient on a litter together with a medic providing treatment, or

2. Two patients on litters without a medic, or

3. Ambulatory patients seated in passenger seats (McQueary 2007b, 13).

(3) Unsuccessful aerial sustainment missions

The two unsuccessful aerial sustainment missions failed because the helicopters could not safely lift an external 2,200-pound load, which is the weight of a large water-filled external firefighting bucket, while operating at 4,000-feet pressure altitude and at 95^{o}F, and being capable of conducting a 2.8-hour mission with a 30-minute fuel reserve. The IOTE also revealed the UH-72A's inability to carry an internal load of 1,250 pounds while operating under those conditions. In order for the UH-72A to operate under those conditions, it was necessary to either reduce the internal load by143 pounds (resulting in an internal load of 1,117 pounds), shorten the mission by 22 minutes, or do both (McQueary 2007b, ii, 9, 10, 11, 14, 15; W58RGZ-05-R-0519 SOW, paragraphs A.2.2.2 and A.2.2.3.1). (As stated in paragraph A.2.*a*.(1) of this chapter, these external and internal lift capabilities were tradeable elements. Although the lack of the required external load capacity diminishes the UH-72A's fire-fighting capability, firefighting was not one of the originally intended uses for the UH-72As, although they have been used for that purpose (Bledsoe 2013; Davis 2007)).

(4) Successful aerial sustainment missions

The IOTE also included two aerial sustainment missions that were successful. During these missions, the UH-72As successfully delivered external loads that weighed 1,190 pounds. Also, the safety testing of the UH-72As, which was conducted prior to the IOTE, in December 2006 through January 2007, showed that the aircraft is capable of conducting fire-fighting missions using “a fire-fighting water bucket weighing approximately 1,400 pounds[,]” which is approximately 168 gallons (McQueary 2007b, 5, 11 (quotation); Rowlett 2005).

(5) Additional report findings

The IOTE report states that although the UH-72A does not meet the respective 2,200 pound and 1,250-pound requirements for external and internal loads, when carrying an external load of 1,500 pounds or less, it vastly outperforms the UH-1 (one of the helicopters it was purchased to replace). The UH-72A can provide a far longer mission time than the UH-1. With a 1,500-pound load, the UH-72A can provide 97 minutes of mission time, as compared to 7 minutes for the UH-1. With a 1,000-pound load, the UH-72A provides approximately 170 minutes of mission time, as compared to about 55 minutes for the UH-1. (The other helicopter that the UH-72A was purchased to replace, the OH-58 A/C, does not have an external lift capacity (McQueary 2007b, 15)).

All other missions (passenger transportation, search and rescue, and response team insertion) were successfully completed during IOTE. The IOTE showed that except as described above, the UH-72A met all critical (non-tradeable) requirements, as described in paragraph A.2.*a*.(1)(a) of this chapter. In addition, pilots participating in the IOTE found the UH-72A’s “avionics and flight management systems effective and easy to use.” The IOTE also showed that the UH-72A can fly faster, for a longer period of time, and a greater distance than either of the two helicopters it is replacing (McQueary 2007b, 9, 10, 14–16).

b. Operational Suitability[30]

The UH-72A helicopters were not operationally suitable. The main basis for this conclusion was the helicopter's tendency to overheat (as described in paragraph C.1 of this chapter). Other problems also lead to this conclusion:

(1) Overheating

The excessive heat was the result of the greenhouse effect of the sun shining through the UH-72A's large windows, inadequate ventilation, and heat produced by the aircraft avionics (McQueary 2007b, 17; Chavanne 2008). The high cabin and cockpit temperatures affected crew performance and endurance—particularly for those missions requiring the crew to wear nuclear, chemical, or biological protective gear—and had the potential to exacerbate the medical problems of patients or casualties being evacuated (McQueary 2007b, 17–18). Also, because the UH-72A is used for transportation of personnel, including high ranking military officers, the adverse effect of elevated cabin temperatures (sometimes over 100^{o}F) on passenger comfort was an additional aspect of the UH-72A's operational unsuitability. Additionally, according to the aircraft's flight manual, if temperatures exceed safe operating ranges, various avionics components have only a 30-minute operating time. This 30-minute operating time limit did not occur during the IOTE because ambient temperatures were moderate at that time. The elevated cabin and cockpit temperatures were of particular concern in view of the fact that the UH-72As were purchased with the intent of fielding them in geographic locations with high temperatures and high humidity (McQueary 2007b, 17–18).

(2) Other aspects of operational unsuitability

The IOTE report listed the following additional problems contributing to the lack of operational suitability.

(a) Ingestion of foreign objects, particularly sand and dust, by the engines

As stated in paragraph C.1 of this chapter, this problem was identified after IOTE, but was noted in the IOTE report (McQueary 2007b, 22). The problem was resolved by the installation of engine inlet barrier filters (EIBFs) on aircraft being deployed to dusty or sandy environments (Gourley 2010). Installation of the EIBFs began in 2008 (“Eurocopter’s EC145 Inlet Barrier Filter,” n.d.).

(b) Inadequate space in the MEDEVAC configuration

As discussed in paragraph C.2.*a*.(1) of this chapter, the lack of cabin space in the MEDEVAC configuration made it difficult for medics to perform their tasks (McQueary, 2007b, 22). The modifications to address this problem are described in paragraph A.2 of Chapter IV.

(c) Inadequate radio communications

Although the radio communications were very good in some respects, as described in paragraph (3) of this section C.2.*b*, helicopter users could not communicate simultaneously on both FM and UHF channels, which Army aviators commonly do on military airfields. This problem was resolved by installing ARC 231 multi-band radios in the helicopters, particularly those in the S&S MEP configuration. These radios enable simultaneous communications on both FM and UHF (McQueary 2007b, 20–21). The ARC radios are described in greater detail in paragraph C.2.*d*.(2)(g) of Chapter II.

(d) Lack of ready accessibility of first aid kit and fire extinguisher

The first aid kit was not readily accessible to either the crew chief or the passengers. The same was true for the fire extinguisher, which was located in the cockpit.

(e) Lack of skid shoes

The UH-72As were procured without skid shoes. Skid shoes protect the landing gear, prolong its life, “and reduce overall life cycle costs” (McQueary 2007b, 22 (quotation), 27).

(3) Other conclusions of the IOTE report

Although the IOTE report stated that UH-72A was operationally unsuitable due to the above described problems, that report stated a number of positive aspects of UH-72A performance. In addition to UH-72As being easy to fly and operate (as discussed in paragraph C.2.*a*.(5) of this chapter), the IOTE report noted that the UH-72As “exceeded reliability, availability and maintainability” (average time to repair) requirements

(McQueary 2007b, 19). In addition, the UH-72A provided reliable communications with many military and civilian agencies, including air traffic control agencies (military and civilian), civilian emergency responders, and non-government agencies. In addition, the radio systems were easy to use, as were the navigation systems. Also, the instrument flight rule package and the autopilot system eased pilot workload (McQueary 2007b, 20–21, 23–24).

NOTES ON CHAPTER III

1. Out of Ground Effect (OGE) is a condition in which there is no downwash of air from the main rotor reacting with a hard surface (the ground), which, when present, thereby provides the helicopter some lift force. OGE occurs when the distance between the helicopter and the ground is greater than 0.5 to 1 rotor diameter. Since there is no downwash of air providing the helicopter lift force, it requires more engine power to hover at a constant altitude when the helicopter is in OGE than when the helicopter is close enough to the ground for the downwash of air to provide some lift force. This latter condition is called In Ground Effect (IGE) ("IGE, OGE and Recirculation" (Helis), n.d.).

2. Paragraphs M.2.3, M.2.3.1.1, M.2.3.2.1, M2.3.3.1, M.2.3.3.2, M.2.3.3.3, L.2.4.3.1.1, L.2.4.3.2.1, L.2.4.3.2.1.1, L.2.4.3.3.1, L.2.4.3.3.2, L.2.4.3.3.3, and Statement of Work (SOW), Annex A, Tables 1 & 2, and paragraphs A.2.1.1, A.2.2.1, A.2.3.1, A.2.3.1.1, A.1.1, A.1.2, A.2.3.2, and A.2.3.3.

3. Joint Publication 1–02, Department of Defense Dictionary of Military and Associated Terms (November 8, 2010, as amended through August 10, 2014), defines "electromagnetic vulnerability" as "The characteristics of a system that cause it to suffer a definite degradation (incapability to perform the designated mission) as a result of having been subjected to a certain level of electromagnetic environmental effects."

4. "Endurance" is the length of time the helicopter can fly without refueling or using auxiliary fuel. (RFP W58RGZ-05-R-0519 Statement of Work (SOW), paragraph A.2.2.2).

5. "Internal and external loads" are, respectively, the weight that can be carried inside the cabin, and the weight that can be carried suspended from a sling underneath the helicopter (Interagency Helicopter Operations Guide, 2013). http://gacc.nifc.gov/sacc/logistics/aircraft/IHOG.pdf.).

6. "'Autorotation' refers to the descending maneuver where the engine is disengaged from the main rotor system and the rotor blades are driven solely by the upward flow of air through the rotor" ("Autorotation (helicopter)" (Wikipedia) 2014).

Paragraph A.2.2.4 of the LUH SOW stipulates that the LUH should be able "to safely auto-rotate to a safe landing[.]" (direct quotation).

7. "Operational range" is how far the helicopter can fly (RFP SOW, paragraph A.2.2.5).

8. RFP SOW paragraph A.2.2.9 describes the variety of conditions under which the helicopter must be capable of being operated, including high/hot conditions; urban environments, in and over forests, deserts, farmland and water; and in tropical and harsh winter weather conditions; low visibility, including fog and night-time; etc.

9. A wire strike protection system is a system of components designed to mitigate the risk of wire strikes when flying at low altitudes and when taking off and landing. It is designed to cut a wire before it can entangle a rotor system or cause a helicopter to crash (“Wire Strike Protection System” (Wikipedia) 2014).

Paragraph A.2.3.5 of the RFP SOW requires that the wire strike protection system protect 90% of the frontal area of the helicopter.

10. “System growth potential” refers to the helicopter’s ability, in terms of space, electrical power, etc., to accommodate system upgrades to mission equipment. (RFP SOW paragraph A.2.3.6).

11. “Open-port refueling is refueling by inserting an automotive-type nozzle into a fill port of larger diameter.” (Technical Manual (TM) 1–1500–204–23–1, General Aircraft Maintenance (General Maintenances and Practices), Volume 1, paragraph 3–5(a), 1992).

“Pressure refueling” involves pumping in fuel at a high pressure with a high pressure hose (“Aviation fuel” (Wikipedia) 2014).

RFP SOW paragraph A.2.3.8 required that the LUH be capable of being refueled using both systems.

12. “Human factors engineering” refers to “capabilities and limitations of human performance in relation to design of machines, jobs, and other modifications of the human’s physical environment.” “Answers” website, no date. The “Answers” website displays information from the McGraw Hill Science & Technology Dictionary.

13. “An airworthiness certificate is an FAA document which grants authorization to operate an aircraft in flight” (“Airworthiness Certificates Overview” (Federal Aviation Administration) 2011).

14. The text of the GAO decision does not explicitly state that all four offerors participating in the SSPD remained in the competitive range, but this conclusion can be inferred from the text.

15. The budget submissions do not indicate whether these funds are for modifications to all utility helicopters, or if the funds are specifically for modification of light utility helicopters. The budget submissions also do not specify the types of modifications.

The budget submissions for fiscal years 2005 and 2006 do not show any funds budgeted for utility helicopter modification.

16. The Fiscal Year 2009 budget shows the number of LUHs acquired as 43, but page A-3 of the Fiscal Year 2010 budget (listed below) shows the number as 42.

Brashear (2008b) shows the number as 43.

The Selected Action Report for the Light Utility Helicopter (LUH) as of December 31 2011 and the Selected Action Report for the Light Utility Helicopter (LUH) as of December 31 2012 both show the number as 42.

17. Page A-5 of the Fiscal Year 2010 budget shows this figure as $65.9 million.

18. Page A-3 of the Fiscal Year 2011 budget shows this figure as $276.4 million.

19. Page A-4 of the Fiscal Year 2011 budget shows this figure as $41.0 million.

20. Page A-3 of the Fiscal Year 2012 budget shows this figure as $325.0 million.

21. Page A-5 of the Fiscal Year 2012 budget shows this figure as $139.2 million.

22. Page A-3 of the Fiscal Year 2013 budget shows this figure as $303.5 million.

23. Page A-4 of the Fiscal Year 2013 budget shows this figure as $128.5 million.

24. Page A-3 of the Fiscal Year 2014 budget shows the same figure, $250.4 million.

25. Page A-4 of the Fiscal Year 2014 budget also shows this figure as $74.7 million.

26. As stated in paragraph C.1.*b*.(1) of Chapter II, in January 2014, Congress passed a budget allocating $171 million, not $96.2 million, for the purchase of 20, instead of 10, LUHs in Fiscal Year 2014.

27. High temperatures in the Fort Rucker vicinity in February and March are generally in the high 60's and low 70's Fahrenheit (WeatherForYou: Dale County, Alabama © 2014).

High temperatures in the Fort Irwin vicinity in February and March are generally in the mid 60's and low 70's Fahrenheit. (USA.com: Ft. Irwin, CA weather © 2014).

28. The GAO decision states that helicopters that could seat 8 or more passengers in the standard configuration, or that could accommodate 4 or more litters in the MEDEVAC configuration would be rated "Excellent" for cabin size.

29. "Military Definitions" (n.d.) defines "operational effectiveness" as the degree to which a system accomplishes its mission "when used by representative personnel in the environment planned or expected…for operational employment of the system[.]" (direct quotation).

30. "Military Definitions" (n.d.) defines "operational suitability" as the degree to which a system can be satisfactorily used in the field, considering such factors as "availability, compatibility, transportability, interoperability, reliability, wartime usage rates, maintainability, safety, human factors, manpower supportability, logistic supportability, natural environmental effects and impacts, documentation, and training requirements" (direct quotation).

IV. CURRENT STATUS OF THE LUH PROGRAM

As indicated in paragraph C.1.*b*.(1) of Chapter II, to date the Army has ordered approximately 349 UH-72A helicopters. Due to budget cuts, the Army's UH-72A acquisition program is likely to end after the delivery of the 37 helicopters whose purchase was funded in 2014 (the 20 whose purchase was funded in January 2014 and the additional 17 ordered in October 2014), unless another customer orders more, or unless the Army succeeds in its quest to purchase an additional 100 helicopters (or a portion thereof), as described in paragraph C.1.*b*.(2) of Chapter II. All helicopters delivered to date have been delivered on-time or ahead of schedule (Tomkins 2014b). The helicopter has maintained an operational rate of 90% or better (Lopez 2012; Thurgood and Bristol 2010b). This chapter provides further details concerning the current status of the UH-72A acquisition program.

A. MODIFICATIONS TO UH-72A HELICOPTERS

Paragraphs C.2.*b*.(2)(a) and (c) of Chapter III discussed modifications made to the UH-72As to address the problems of sand and dust ingestion, and inadequate radio communications, which were two of the problems identified during IOTE and early fielding of the helicopters. In addition to the previously described modifications, the UH-72As have also been modified as follows:

1. Modifications to Address Overheating

To address the problem of the helicopters overheating, EADS installed a ventilation system consisting of airflow deflectors and four pop-out window vents installed in the helicopter doors. The airflow deflectors and the vents provide for increased airflow through the helicopters. EADS also installed spoiler kits, which allow the helicopters to fly with their doors open. In addition, to decrease the greenhouse effect in the cockpit, EADS installed sunshades for the pilot and co-pilot (Chavanne 2008; Gourley 2008; McQueary 2007a, 77; McQueary 2008, 83). Gourley (2010) quotes LTC Bristol, then the product manager, as saying that the aircraft ventilation system "has worked out very well." McQueary noted in the Fiscal Year 2008 edition of the Director, Operational Test and Evaluation Report (December 2008, 83), "These solutions allow the LUH to operate with acceptable internal temperatures in all mission configurations."

In addition to the above modifications, the Army took the unusual additional step of adding air conditioners to the UH-72A helicopters in the MEDEVAC and VIP configurations. As stated in paragraph C.2.*c*.(2)(d) of Chapter II, because air conditioning increases helicopter weight and diminishes performance, the military usually avoids incorporating air conditioning in its aircraft. Other military helicopters, such as the UH-60, do not have air conditioning, and those helicopters do not overheat (Davis 2007).

2. Modifications to Address Inadequate Space in MEDEVAC Helicopters

To address the problems of the MEDEVAC-configured helicopters lacking sufficient space to allow for a medic to provide treatment to two evacuees on litters, lacking ceiling rails for hanging intravenous lines and for storing and securing equipment, and the additional problem of insufficient lighting, the following modifications were made:

a. Installation of a Wall-mounted MEDEVAC Equipment Rack and FAA-Approved Ceiling Rails in Each MEDEVAC Helicopter

This modification provided soldiers better access to medical gear than did the previous arrangement of storing the gear in a canvas bag on the helicopter floor (McQueary 2007a, 77; "Guard Units Receive More High-Tech Lakota Helicopters" 2008). The Fiscal Year 2008 edition of the Director, Operational Text and Evaluation Report, which McQueary authored, stated, "This kit allows for more litter space and equipment storage and vastly improves the flight medic's ability to adequately perform or sustain critical medical care on one litter patient while another litter patient is aboard" (McQueary 2008, 83).

b. Installation of Additional Lighting

The above-cited later McQueary reports (2007a, 2008) do not explicitly state that the installation of additional lighting did or did not address the problem of insufficient lighting. In the context of the above-quoted statement in the Fiscal Year 2008 report, and in the absence of an explicit statement that the installation of additional lighting did not adequately address the problem, it would be reasonable to conclude that additional lighting did adequately address the problem.

3. Other Modifications to the UH-72As

Other modifications were made to the UH-72A as various needs were identified. These modifications included, but were not limited to:

a. Hardened Windscreens (Bristol 2011, slide 5)

As discussed in paragraph B.1.*a* of this chapter, sand caused extensive window scratching, which inhibited visibility. One can speculate that the purpose of the hardened windscreens was to address this problem.

b. Side Facing Bench Seats in MEDEVAC Helicopter (Bristol 2011, slide 5)

One can speculate that the purpose of the side facing bench seats was to make it easier for medical personnel to tend to evacuees.

c. Blue Force Tracker (BFT)

BFT is a GPS-enabled system that provides location information about friendly and hostile military forces (Nelms 2012a; "Blue Force Tracking" (Wikipedia) 2014). BFTs were added to selected units of VIP-configured helicopters (Bristol 2010, slide 5). One can speculate that the purpose of adding the BFT was to help ensure avoidance of mid-air collisions.

d. Hontek Blade Coating on the Main Rotor Blade

Since erosion from sand is common in desert environments, the purpose of the blade coating is to reduce erosion damage to the rotor blades. The initial intention was to add the blade coating (manufactured by Hontek) to all aircraft (Brashear 2008c).

e. Wide Area Augmentation System (WAAS)

WAAS is an air navigation aid that augments the GPS ("Wide Area Augmentation System" (Wikipedia) 2014). The initial intention was to add the WAAS to all aircraft (*Selected Action Report (SAR) on the LUH*, December 31, 2011, 25). Due to budget constraints, however, only 100 aircraft received one (*Selected Action Report (SAR) on the LUH*, December 31, 2012, 5).

f. Cockpit Voice Data Recorder/Flight Data Recorder (CVDR/FDR)

The initial intention was to add the CVDR/FDR to all aircraft (SAR on the LUH 2011, 25). Due to budget constraints, however, only 139 aircraft received this equipment (SAR on the LUH 2012, 5).

B. PROBLEMS WITH LUHS DELIVERED TO DATE

Except as described next, extensive literature search revealed no problems with LUHs delivered to date (other than those discussed in Section C of Chapter III). There were two exceptions to this absence of descriptions of problems in literature: a) One exception was an undated posting (no longer available) by CW3 (now CW4) Daron Hankins, a Lakota pilot instructor, on Army Knowledge Online (https://www.us.army.mil), "Fielding the UH-72A Lakota," which was apparently posted between mid-2010 and late-2012;[1] and b) The other exception was an article, "Old Habits are Hard to Break," posted in the September 2008 edition of the publication Knowledge.

1. Daron Hankins' Posting

Daron Hankins' posting described the following problems with the UH-72A helicopters:

a. The Ingestion of Sand and Dust into the Engines Damaged the Engines and the Avionics

The engines had to be replaced every 50 hours. (The posting did not state the normal frequency of helicopter engine replacement, but implied that the 50-hour interval was a higher than expected frequency). Even though the installation of EIBFs addressed the problem of sand ingestion into the engines, sand became stuck under buttons, which made the buttons inoperable when they were needed to function. Also, the sand caused extensive window scratches, which caused serious visibility issues.

b. Lakotas' Limited Capabilities Inhibited Mission Accomplishment

Because the Lakotas have less capacity than the Blackhawks, the one-for-one exchange of Lakotas for Blackhawks in some units reduced those units' abilities to perform their missions. Blackhawks can carry 11 troops or six stretchers, as opposed to the Lakota's capacity for six to nine passengers or two stretchers ("Sikorsky UH-60 Blackhawk" (Aeroweb) 2014). Missions that could be accomplished with three Blackhawks require five or six Lakotas. Thus, units that have had a one-for-one exchange of Blackhawks for Lakotas cannot maintain their previous operational tempo.

2. "Old Habits are Hard to Break" Article

The 2008 article, "Old Habits are Hard to Break," stated that because of the lack of skid shoes (a deficiency noted in the IOT&E report), the UH-72As could not perform running landing maneuvers to hardened improved surfaces.

C. SATISFACTION LEVEL OF LUH USERS

Except as described in Section B of this chapter, all information derived from literature search indicates a high degree of user satisfaction with the UH-72A helicopters. The users quoted in the articles researched included pilots and medical personnel traveling on medical evacuation missions. The articles reported no negative comments from users, only favorable ones. These articles reported the users described the attributes of the UH-72As as beneficial, and they also compared the UH-72A favorably against the helicopters it was purchased to replace or partially replace, the OH-58A (Kiowa), the UH-1H ("Huey"), and the UH-60 (Blackhawk). (Some users quoted in the articles had also piloted at least one of the other three helicopters. Those users' quotations indicated a preference for the UH-72A over the other three).

1. Positive Attributes of the UH-72A Described by the Users

The articles researched stated that pilots who had flown UH-72As reported positive attributes about these helicopters.

a. Speed

In the articles researched, the most frequently mentioned attribute was speed; one pilot noted that the UH-72A flies 20 to 30 knots (23 to 34½ mph) faster than the UH-1H (Cross 2008; Dubiel 2009; Miller 2013; Nelms 2009; Orrell 2012; Soucy 2009).

b. Agility

Another frequently mentioned attribute was agility, made possible largely by the UH-72A's small size, which makes it possible to land them in landing zones that are too small for "Hueys" or Blackhawks (LeBlanc 2011; Krussow 2012; Nelms 2009; EADS feature story, March 12, 2009, "The First MEDEVAC-Configured UH-72A").

c. Endurance

Several articles quoted users praising the UH-72A's endurance. It can be flown for three to three and a half hours and can travel for 300 miles without refueling (Nelms 2009).

d. Smooth Ride and Ease of Handling and Operation

A couple of articles described users' favorable comments on the smoothness of the UH-72A's ride and the ease of handling. These are made possible by the rotor system (Nelms 2009; EADS feature story March 12, 2009; "The First MEDEVAC-Configured UH-72A").

e. Avionics Package

Several users were quoted in the articles as praising the avionics package, which they said eased pilot workload. They stated that the avionics package makes it possible for the helicopters to be piloted by a single pilot, without the assistance of a co-pilot (Krussow 2012; Nelms 2009; EADS feature story, March 12, 2009, "The First

MEDEVAC-Configured UH-72A”). David Krussow’s 2012 article, “Two of a Kind,” quoted a flight nurse as saying, “Our pilots absolutely love the avionics.” An experienced UH-72A pilot that the author interviewed stated, “The instrument [*sic*] are GREAT! Flying with a modern glass cockpit compared to the older instrument package from the 70’s [*sic*] you just can’t beat” (C. Rindal, personal communication, November 20, 2014).

f. *Versatility*

Several quoted users used the adjective “versatile” to describe the UH-72A. Users listed a variety of missions for which the UH-72A is well-suited, including medical evacuation, search and rescue (particularly flash flood rescue), and law enforcement, including counter-drug operations and border security (Krussow 2012; LeBlanc 2011).

g. *Lower Operating Cost*

One quoted user stated that use of UH-72As in lieu of Blackhawks saved almost $3,000 per flight hour during a mission in Haiti (LeBlanc 2011). Orrell’s 2012 article, “Maryland Army Guard Unveils Newest Helicopter in its Arsenal,” quoted Maryland National Guard officials as stating that “the Lakota can be maintained and operated at one half the cost of the UH-60 Blackhawk.”

2. Users’ Comparisons of the UH-72A against the UH-1H and the OH-58

Several articles reported users’ comparisons of the UH-72A against its predecessors. One pilot equated the older helicopters with “the Barney Rubble of helicopters” and the UH-72A with “the Buck Rogers of helicopters” (Tracey 2012). Even CW3 (now CW4) Hankins’ highly critical posting, “Fielding the UH-72A Lakota,” states, “The Lakota program is a good thing for the Army and takes Army Aviation [*sic*] into a whole new era.”

The author asked a pilot who had flown the UH-72A, the “Huey,” and the OH-58 the question, “How do the LUHs compare with their predecessors, the Kiowas and the Hueys?” His response was:

> They are all very different aircraft and it is very hard to compare them. The Huey is a very forgiving aircraft in my opinon [*sic*] a perfect trainer

> for young aviators to fly, the Kiowa also has it [*sic*] own unique benefits. The UH-72 was the Army's 70/120 solution to replacing them both, its capability can do about 70% of what the UH-1 could do, and 120 [*sic*] of what the OH-58 could do. Having flown all three of these aircraft, as a pilot I like the UH-72 the best, it really depends on the mission that I need to perform. I can tell you I miss flying the UH-1, but do not miss the OH-58 at all. (C. Rindal, personal communication, November 20, 2014)

a. UH-1H

One pilot described the UH-72A as being "two generations above" the Huey (Soucy 2009). One article quoted the senior Army aviation officer for the Washington, DC Army National Guard as saying, "These aircraft [the UH-72As] have autopilot and GPS and automation systems that far outshine what's on the UH-1" (Soucy 2009). As indicated above, one user noted that the UH-1 does have a greater capacity than does the UH-72A, and it is better suited for some missions.

b. OH-58

One pilot stated, "The [OH-58] was good, but this one [the UH-72A] has a lot more capabilities. [It] has a lot more radios, a little bit more power…" (Orrell 2012). Another pilot stated, "I love flying this helicopter [the UH-72A] versus the OH-58 because of its new technology[.]" Another pilot stated, "It has a lot more power than the OH-58 allowing it to carry more people and haul more equipment[.]" (Cross 2008).

NOTES ON CHAPTER IV

1. In the posting, the author stated that he had been flying the UH-72A for 3½ years, as one of the Army's first instructor pilots. The first UH-72A was delivered in late 2006. 3½ years after that time would be mid-2010. The first order of UH-72As following approval of Full Rate Production was in late 2007. Assuming that deliveries began approximately 6 months following the order, 3½ years following those deliveries would be late 2011 or early 2012. The article includes the phrase, "After nearly four and a half years of operational time[.]" 4½ years following the presumed mid-2008 deliveries of the first helicopters ordered after approval of Full Rate Production would be late 2012. (The article references a 2009 training manual, so it could not have been written before then).

V. OVERALL SUCCESSES OF THE UH-72A ACQUISITION

This chapter enumerates the successes of the UH-72A acquisition program, the bases of these successes, and the applications of lessons learned for other MDAP acquisitions.

A. ACQUISITION OF THE REQUIREMENT AS A COMMERCIAL ITEM

The EC-145 helicopter, which, with slight modifications, became the UH-72A helicopter, was a commercially available item with mature technology.

1. Advantages Provided by the Commercial Availability and the Technological Maturity of the Acquired Item

Many of the successes of the UH-72A acquisition program occurred because the UH-72A was based on a commercially available item that was already in production. The sub-paragraphs of this paragraph A.1 describe the advantages provided by such an acquisition strategy.

a. Obviation of Need to Expend Money or Time for Research and Development

(1) Money

The total expenditure for Research, Development Testing and Evaluation (RDT&E) for the UH-72A was approximately $3.3 million, which was presumably spent to pay for the initial operational tests. By contrast, the RDT&E cost for the UH-60 helicopter was $1.698 billion (Gansler and Lucyshyn 2008, 34; *Modernizing the Army's Rotary-Wing Aviation Fleet* 2007, 4, 5).

(2) Time

As noted in paragraph B.2.*a* of Chapter II, development of new aircraft can take seven to 10 years, sometimes longer. (It took six years to develop the UH-60 helicopter (Gansler and Lucyshyn 2008, 34)). By contrast, the contract for the UH-72A helicopter was awarded only one and a half years after issuance of the draft request for proposal, and the first UH-72A helicopter was delivered within five months thereafter.

b. Obviation of Need for Production Ramp-up Time

Because EADS was already producing the EC-145 helicopters, and only slight modifications were needed to produce the UH-72A helicopters, EADS did not need time to ramp-up production of the UH-72A helicopters. The obviation of the need for ramp-up time contributed to the expeditious production and delivery of these helicopters.

c. Avoidance of Cost Overruns and of Performance and Delivery Delays

The problems of cost overruns and behind-schedule contract performance, both common with developmental items, were avoided. As stated in the introductory paragraph of Chapter IV, all UH-72As were delivered either on-time or ahead of schedule, and as stated in paragraph A.2 of Chapter II, based on the PAUC and APUC metrics, the program was on-budget as of December, 2012, by which time, approximately 85% of the helicopters had been delivered.

d. Lower Overall Cost

The Army's overall cost for the development, manufacturing, and logistics support was, and continues to be, lower than the costs the Army would incur if the Army had chosen to develop a new helicopter, instead of purchasing a commercially available one. Gansler and Lucyshyn (2008) state that the acquisition of COTS items allows for lower costs. The lower costs are made possible by the above listed costs being "amortized over a much larger customer base" (p. ix). The customer base for a commercial item usually includes DOD, non-DOD government agencies, and customers in the private sector; whereas, for developmental items, DOD is often the sole customer. John Burke, Airbus Group's Lakota program manager, noted that the UH-72A was developed through industry-funded—not government-funded—research. He further stated that Eurocopter (now Airbus Helicopters) had a large commercial helicopter fleet and could "leverage the commercial technology used in those programs" (McHale 2011b (quotation); Weisberger 2014). His statement is a confirmation of the above-cited conclusion of the Gansler and Lucyshyn report.

e. Availability of Latest Commercially Available Technology

The acquisition of a commercially available helicopter afforded the Army the opportunity to avail itself of the latest commercially available technology. Gansler and Lucyshyn (2008) note that with the current rapid changes in technology, "DoD…no longer holds a monopoly on all military-relevant technology" (iv (quotation), vii). Gansler and Lucyshyn further state that in order to avail itself of the latest technology, DOD must use commercially developed technology (ix, x, 24).

f. Availability of Competition

There was competition available, which afforded the government a choice of a range of models with various attributes. Also, the existence of competition encouraged the offerors to offer their best prices, particularly since price was the most important selection criterion. (Developmental items are often provided in a sole-source environment, inhibiting the government's ability to negotiate a favorable price). The 2008 Gansler and Lucyshyn report notes that in addition to ensuring price competition, a competitive environment encourages innovation (ix, x, 24).

2. Lesson Learned

The main lesson learned from the Army's mostly successful experience with the acquisition of a commercially available helicopter is that the government should acquire commercially available, non-developmental items, in lieu of developmental items, when non-developmental items will meet the government's needs.

The 2008 Gansler and Lucyshyn report describes several successful DOD acquisitions of commercial items that met the government's needs and were acquired more quickly and/or at a lower cost than would have been possible if DOD had acquired developmental items. The acquisitions described in that report include the Navy's purchases of a submarine sonar system and a computer system for an early warning program.

Another example of DOD's successful acquisition of a non-developmental item is the Army's purchase of Mine Resistant Ambush Protected (MRAP) Vehicles, of which

DOD acquired tens of thousands, mainly between 2007 and 2012, mainly for use in combat in Iraq and Afghanistan ("Mine Resistant Ambush Protected (MRAP) Vehicle Program" 2012). The MRAP technology had already been developed, and at the time the need for MRAP vehicles was identified, there were several manufacturers producing MRAP vehicles (Blakeman, Gibbs and Jevasingam 2008, 6, 10). The MRAP acquisition program showed that non-developmental items can sometimes be used even in heavy combat situations.

B. COOPERATION BETWEEN THE PRODUCT OFFICE AND THE USERS

Cooperation between the product office and the users of the product contributed to the success of the UH-72A acquisition program. This section describes the nature of that cooperation.

1. Nature and Benefits of Cooperation

As stated in the last two paragraphs of Section A.2 of Chapter II, the acquisition of the Lakota helicopters involved extensive coordination between TRADOC, the Army National Guard, Army Staff, the LUH product office, and affiliated Army and DOD agencies; this coordination contributed to the unusually rapid acquisition of the UH-72A helicopters. The success of the joint efforts of the National Guard and the LUH product office was particularly evident in the development of the Security and Support (S&S) MEP. Those joint efforts involved reviewing lessons learned from the field, building the National Guard's requirements, and designing a state-of-the-art MEP that met all of the National Guard's requirements. As discussed in paragraph C.2.*d*.(2) of Chapter II, the resulting S&S MEP-equipped helicopters included equipment that greatly enhanced the utility of these helicopters for use in the performance of the missions for which they were intended, such as drug interdiction, border patrol, other law enforcement operations, and search and rescue operations. In addition, S&S MEP-equipped helicopters included equipment such as touch screen displays and soft keyboards which had never before been included in Army helicopters (Bledsoe 2011).

2. Lessons Learned

The lessons learned from the positive results of the close collaboration of the various stakeholders are the following:

1. Such collaboration encourages the expeditious acquisition of a requirement.

2. Such collaboration fosters acquisition of equipment well-suited for the users' needs.

C. DEVELOPMENT OF MEPS TO TAILOR UH-72AS TO VARIED USER NEEDS AND INCORPORATE NEW TECHNOLOGY

The addition of MEPs made possible the use of UH-72As for purposes for which they were unsuited in their initial manufactured state. This section describes the processes by which MEPs were incorporated into the UH-72A helicopters.

1. Development Procedure

The UH-72As were acquired with the understanding that some users might have operational requirements not met by the capabilities of the commercially developed helicopters. Users having such requirements could submit Operational Needs Statements (ONSs) requesting MEPs to meet the required, but lacking, capabilities. The MEPs were developed after receiving HQDA approval (Brashear and Ringbloom 2007[1]; Brashear 2008a). Several MEPs, which are described in paragraph C.2.*d* of Chapter II, were developed, meeting specialized requirements for the Security and Support (S&S) battalions, the Combat Training Center (CTC), and for transportation of key personnel. Each MEP-equipped UH-72A had an equipment package uniquely tailored for its intended use. In addition, as noted in paragraph B.1 of this chapter, the S&S MEP included equipment never before included in an Army helicopter.

2. Lessons Learned

The lessons learned from the Army's use of MEPs are the following:

a. MEPs Can be Used to Tailor COTS Items to Specific Needs

Although the above-cited 2008 Gansler and Lucyshyn report recommends that DOD meet its requirements by acquisition of commercial items when such will meet DOD's needs, it does so with the caveat, "COTS hardware may not be designed to meet all military environmental requirements" (p. viii). The successes of the addition of the various MEPs to the UH-72A helicopters, which satisfied, sometimes highly, diverse user needs, show that COTS items can be successfully tailored to meet unique military requirements, even though COTS items as originally manufactured often do not satisfactorily meet all needs of their military users.

b. MEPs Allow for Appropriate Incorporation of Technological Advances

The use of MEPs allows for the incorporation of technological advances in hardware (and software) into equipment, and in a way that at the time of the UH-72A acquisition was DOD's preferred strategy for such incorporation.

(1) Incorporation of technological advances

The addition of the S&S MEP to a substantial percentage of the UH-72As shows that new technology can be successfully incorporated into previously acquired COTS items.

(2) Use of an evolutionary acquisition strategy

The Army's total experience with incorporating the various MEP packages into the UH-72As is an example of a successful application of the strategy of evolutionary acquisition. An evolutionary acquisition strategy is one in which capability is delivered in increments, based on recognition at the time of initial acquisition of an item of a need for future improvements in capability (DOD Instruction 5000.02, 2008, 13).

(a) The recently cancelled DOD Instruction 5000.02, Operation of the Defense Acquisition System (December 2008) stated that evolutionary acquisition is DOD's preferred strategy for rapidly acquiring mature technology (Interim DOD Instruction 5000.02, 2013; DOD Instruction 5000.02, 2008). It asserted DOD's objective of quickly making capability available to the user and balancing needs and available capability with resources. It stated that an evolutionary acquisition strategy “depends on phased definition of capability needs and system requirements, and the maturation of technologies that lead to disciplined development and production of systems that provide increasing capability over time[,]” and that it “requires collaboration among the user, tester, and developer” (DOD Instruction 5000.02, 2008, 13).

(b) The process of the addition of MEPs to the UH-72As complied with the strategy indicated in DODI 5000.02. As stated above, users defined their unmet needs by submission of ONSs; following HQDA’s approval of the ONSs, MEPs to meet these needs began to undergo development. As also stated above, development of these MEPs involved extensive collaboration among the various stakeholders. In adding the MEPs to the UH-72As, the Army was exactly in compliance with DOD’s preferred strategy for the acquisition of new technology.

D. ADHERENCE TO INITIALLY DEFINED REQUIREMENTS (AVOIDANCE OF REQUIREMENTS CREEP)

Requirements creep is a common cause of program failure. The absence of requirements creep was one of the reasons for the UH-72A acquisition program’s success. This section explains the term “requirements creep” and describes its negative consequences. It also explains why the UH-72A acquisition program did not experience requirements creep.

1. Description of Requirements Creep and the LUH Program’s Success in Avoiding it

a. Definition of Requirements Creep

Requirements creep (also known as scope creep or feature creep) is defined as uncontrolled changes to, or continual enhancement of, a project’s scope or a project’s or product’s requirements. It often leads to budget overruns. It sometimes results from poor definition of requirements when a project is initiated. Sometimes it is driven by users’ growing desires for enhancements or by developers' desires to improve a product ("Scope Creep" (Wikipedia) 2014; "Scope Creep" (The Free Dictionary) 2014; "feature creep (requirements creep or scope creep)" (SearchCIO), n.d.). In some cases, it can lead to program cancellation. Examples of this are the Bell armed reconnaissance helicopter (ARH-70) and Augusta-Westland presidential helicopter (VH-71) programs, which were cancelled in October 2008 and February 2009, respectively, both due to excessive delays and cost overruns ("Bell ARH-70 Arapaho" (Wikipedia) 2014; "Lockheed Martin VH-71 Kestrel" (Wikipedia) 2014). In both cases, changes to requirements after contract award contributed to the problems leading to program cancellation (Wright 2010).

b. The LUH Acquisition Program's Success in Avoiding Requirements Creep

(1) Clear definition of requirements

The requirements for the LUH were well-defined. The acquisition program was initiated with a clear understanding of the purpose for which the helicopters were to be acquired, that is, to replace UH-1H ("Huey") and OH-58 Kiowa helicopters, to free up UH-60 Black Hawks for combat, and to meet homeland security mission requirements. There was a clear understanding of "what would be appropriate to buy" (Tegler 2009). Keith Roberson, the Army's former Deputy Project Manager for Utility Helicopters, attributed the success of the LUH acquisition program to the clarity of its purpose (Tegler 2009; Kesner 2012). For this program, the clear definition of requirements obviated a common cause of requirements creep.

(2) Adherence to requirements

Neil Thurgood, the former project manager for utility helicopters, praised the Army for adherence to its requirements for the UH-72A helicopter, citing this adherence as a major reason for delivery goals being met (McHale 2011b; Osborn 2011; "Brigadier General Neil L. Thurgood United States Army," n.d.). Although there have been changes to many of the UH-72A helicopters since the initiation of production and delivery, these changes have not been uncontrolled. MEPs were developed based upon identification of specific needs for specific modifications tailored to the purposes (training, law enforcement, key personnel transport) for which given sets of helicopters were to be used. Changes to the helicopters, such as the addition of EIBFs and air conditioners, and, for the MEDEVAC helicopters, the addition of ceiling rails, have been made only as the need for them became apparent through testing and use—and only to those helicopters being deployed in environments and for purposes for which the additional equipment is necessary.

All changes to the UH-72A, including those that were and were not part of MEPs, were made in a controlled, disciplined way. As discussed in paragraph C.1 of this chapter, users requested changes by submitting ONSs, which then had to receive HQDA approval. This process served as a restraint to uncontrolled growth.

In addition, all helicopter modifications and MEPs had to be arranged by the Life Cycle Manager, and they had to be contracted through the Original Equipment Manufacturer (OEM). This process was necessary to ensure retention of FAA certification because the OEM was responsible for obtaining, "testing, and integrating new items to FAA standards" (Brashear and Ringbloom 2007). The materiel developer, working together with the users and the OEM, had to "assess the technical and cost feasibility of each desired MEP or modification" (Brashear and Ringbloom 2007). This process enabled delivery of applicable capabilities while maintaining FAA certification (Brashear and Ringbloom 2007). It is likely that the requisite maintenance of FAA certification, and the tight control of the process for making changes in order to ensure such maintenance, was a contributing factor in the avoidance of requirements creep.

2. Lessons Learned

The lesson learned from the Army's experience with avoiding requirements creep in the LUH acquisition program is that the following can help maintain adherence to initially defined requirements, with a consequent avoidance of delays and cost overruns:

a. Initial Clear Definition of Requirements

Clear definition of the requirement sets the parameters of what is to be purchased. Clearly defined parameters make it more difficult to add assets or capabilities not initially called for, unless experience with use of the item clearly demonstrates the need for acquisition of additional assets or capabilities.

b. Need for Tightly Controlled Procedures for Making Changes to a Product and Implementation of Changes only after Demonstration of their Necessity

Such practices can help obviate a change being initiated simply because a user or developer of a product decides that an improvement would be beneficial, even if the improvement is in excess of the defined needs. Having an external control over the changes process, such as the requirement to maintain certification by a non-military agency, can provide a damper on requirements creep.

E. USE OF PRICE, RATHER THAN TECHNICAL SUPERIORITY, AS THE MOST IMPORTANT SOURCE SELECTION CRITERION

As discussed in paragraph A.2.*a* of Chapter III, price was the most important source selection criterion, followed by technical. As stated in paragraph A.3.*a*.(3) of Chapter III, the Army selected EADS' (now Airbus') offered helicopter over AWI's technically superior, but significantly more expensive, offered helicopter, concluding that EADS' offered helicopter had the required technical capabilities stated in the solicitation and would meet the government's needs; further, that the technical superiority of AWI's offered helicopter did not warrant paying its higher price.

1. Less Expensive, Technically Inferior Item Met Government Needs

Even though the UH-72A helicopters offered by EADS (now Airbus) lack some of the technical capabilities possessed by the U.S. 139 helicopters offered by AWI, the UH-72A helicopters have met the government's needs quite well.

a. Satisfaction of Government Needs

Although the UH-72A helicopters have required some modifications in order to adequately meet the users' needs, such as those listed in paragraph D.1.*b* of this chapter and various sub-paragraphs of paragraph C.2.*b* of Chapter III and paragraph A of Chapter IV, the basic UH-72A helicopter has met the users' needs very well. It has many capabilities that its predecessors, the UH-1H (“Huey”) and the OH-58A/C Kiowa helicopters, lacked. Although it lacks some of the capabilities of the UH-60 Black Hawk helicopters, it was purchased to partially replace the need for non-combat use of those helicopters. For many non-combat missions, the UH-72A’s smaller size provides some advantages over the UH-60s, such as diminished rotor wash, easier transportability, lower fuel consumption and operating cost, greater agility, and the ability to land in a smaller landing space.

b. User Satisfaction

Although, as stated in Section B of Chapter IV, there has been some user dissatisfaction with the UH-72A helicopters, the author’s literature search indicates that the vast majority of UH-72A users have had high praise for the helicopter. The UH-72A users’ praise is described in Section C of Chapter IV. Several of the articles from which the author obtained much of the information in that section, and in paragraphs C.2.*a* and C.2.*b* of Chapter II describing the beneficial attributes of the UH-72A, were written by people who had flown the UH-72A (or the EC-145, from which the UH-72A was derived), such as Douglas Nelms (“Living With Lakota”) and Ron Bower (“Flying the EC 145”). Other cited articles, such as “Two of a Kind” by David Krussow; “New Helicopters Delivered to District of Columbia National Guard” by SSG John Soucy; and “New MEDEVAC Fleet Lands at Fort Polk” by Jean Dubiel, quoted heavily from UH-72A users. All user quotations stated high praise for the UH-72A, citing its speed, agility, ease of use, and its technological advances over its predecessors. If any users interviewed for those articles expressed dissatisfaction with the UH-72A, the articles did not so state.

2. Lesson Learned

The lesson learned from the Army’s experience with using price, rather than technical superiority, as the most important source selection criterion is that items lacking ultimate technical superiority and/or desirable assets or characteristics can sometimes more than adequately meet the government’s needs, while saving the government’s money by not purchasing superior, but more expensive, equipment. Thus, choosing price, rather than technical superiority, as the primary source selection criterion can sometimes be a viable acquisition strategy.

F. CAREFUL DOCUMENTATION OF THE SOURCE SELECTION DECISION

Basic training courses for contracting professionals stress the need to thoroughly document all decisions and the reasons for all courses of action. This need for thorough documentation is particularly important for major decisions, such as source selection. The Army's experience with the two GAO protests following initial award of the LUH contract provides an illustrative example of the importance of detailed documentation.

1. Result of Careful Source Selection Documentation

As discussed in paragraphs A.3.*a*.(3) & (4) and A.3.*b* (and subparagraphs) of Chapter III, the responsible contracting officer carefully documented the basis for the source selection decision, both from a pricing and a technical standpoint. Because of this careful documentation, the award withstood two protests to the GAO (from MDHI and AWI), including one from an offeror whose helicopter was technically superior, but more expensive. GAO's upholding of the contracting officer's decision obviated the expenditure of time and money that would have been needed for the re-procurement of the LUH requirement that would have been required if either protest had been successful.

2. Lesson Learned

The lesson learned from the Army's experience with the GAO protest of its award to EADS is that careful documentation of source selection processes enables GAO to uphold a contracting officer's decision, even when a protest has a seemingly reasonable basis.

NOTES ON CHAPTER V

1. Brashear, James, and Kirk Ringbloom. 2007. "UH-72A Lakota—Exceeding Expectations" (Personal Communication; draft article for *Army Aviation)*.

VI. PROBLEMS ENCOUNTERED WITH THE LUH PROGRAM

Although successful in most respects, the LUH acquisition program was not totally free of problems. This chapter describes the problems encountered. It also describes the lessons learned from those problems and the application of those lessons to other MDAP acquisitions.

A. PROBLEMS DISCOVERED DURING IOTE OR INITIAL DEPLOYMENT, BUT NOT REVEALED DURING THE SSPD

As discussed in paragraphs A.2.*b* and C.1 of Chapter III, several problems were discovered during IOTE, or during initial deployment, but were not revealed during the SSPD.

1. Problems

The problems that were identified after contract award are listed below in paragraphs *a–c*. Those paragraphs also explore possible reasons for those problems not having been identified during SSPD.

a. The Helicopter Cabins Were too Small to Accommodate Two Patients on Litters and a Medic to Treat Them

One would expect that the SSPD would reveal a problem of this nature, but it did not.

b. The Helicopters' Cabins Overheated During Use

The SSPD test may have been conducted on a cool, cloudy day, so LUH did not overheat during the SSPD test.

c. Ingestion of Sand and Dust into the Helicopter Engines

The SSPD test was conducted in a non-desert environment, which did not have an abundance of sand and dust, thereby minimizing the likelihood of such ingestion.

2. Lessons Learned

The lessons learned from the Army's experience of failing to identify problems during pre-award testing are the following:

a. Field Testing Will Not Necessarily Identify All Deficiencies

Program managers must be prepared to mitigate problems resulting from unidentified deficiencies. Problem mitigation strategies can include, but are not limited to, the following:

1. Having, or being able to obtain, sufficient funds to correct the deficiencies, either by lobbying Congress to appropriate additional funds or by taking funds from another program; or being prepared to acquire fewer of the end item because of needing to spend additional funds to correct the deficiencies

2. Being prepared to use the item for an alternative purpose for which the deficiency does not matter, even if that alternative purpose was not the originally intended purpose

b. Overall Program Success Can Increase the Likelihood of Congressional Appropriation of Additional Funds

As a corollary to the above lesson, an additional lesson learned is that if an acquisition program is successful in most respects (as the LUH acquisition program has been), this overall success improves the likelihood of additional funds being made available to correct the identified problems, thereby obviating the outcomes of acquiring fewer of the end item or diverting funds from another program. Until the implementation of the sequestration cuts in 2013, the Army was on track to acquire the intended total purchase of 345 UH-72As, despite the need for additional expenditures to correct the identified problems.

Until 2013, during each year of the LUH acquisition program, Congress consistently appropriated sufficient funds to allow purchase of that year's planned increment of UH-72As. In doing so, Congress cited the overall success of the LUH acquisition program. House of Representatives committee reports included such comments as, "The [House Appropriations] Committee is aware of the excellent performance of UH-72A helicopters in both active and reserve component Army units" (DOD Appropriations Bill, Appropriations Committee Report, 2013; May 25, 2012; p. 117). Another committee report stated,

> The committee remains supportive of the UH-72A helicopter program. The [House] committee [on Armed Services] notes that with over 150 aircraft now delivered to the Army on cost and within schedule, the UH-72A has proven to be a robust and efficient multirole platform." (National Defense Authorization Act for Fiscal Year 2012, Armed Services Committee Report, May 17, 2011, p. 22)

The overall success of the UH-72A acquisition program may have been a determining factor in the Army receiving sufficient funds to purchase the helicopters with the needed enhancements; thus, the Army, although having to spend more than anticipated to correct deficiencies, did not have to settle for acquiring fewer UH-72As.

c. When Practicable, Items Should be Field Tested under the Conditions under Which They Will be Used

Such testing should usually take place preferably before award, but certainly not later than shortly after award. Border patrol was one of the intended uses of the UH-72As, thereby necessitating their deployment in the Southwest U.S., much of which has a desert climate. If the Army had conducted the SSPD in such a climate, the problems of the UH-72As overheating even in moderate ambient temperatures, and of engine dust and sand ingestion, might have been identified during the SSPD. AMCOM could have negotiated with EADS (now Airbus) to make the necessary changes to the helicopters, with the attendant additional costs, prior to award. The total cost needed to purchase the helicopters (exclusive of the MEPs) would have thus been known at the time of award, and a portion of the cost overrun of the LUH acquisition program (which was admittedly smaller than the cost overruns of many other MDAPs) would have been eliminated.

If AMCOM, however, had considered conducting the SSPD in a desert environment, the benefits of conducting such testing under the conditions that the LUHs would likely be used would likely have been weighed against the costs of transporting the evaluation personnel from Alabama to the Southwest U.S. and of paying their travel expenses. In addition, moving the SSPD to the Southwest U.S. might have delayed award. Also, the potential benefit of conducting the SSPD in a desert environment might have been negligible, since the IOTE was conducted in a desert environment within a year after contract award, and the problems of UH-72A deployment in such environments could be expected to, and did, became evident at that time. The need for the necessary modifications to the UH-72As, such as the installation of air vents, EIBFs, and air conditioning on selected helicopters, became evident within a few months after commencement of delivery, and the modifications were implemented before many of the helicopters had been manufactured. Identification of the needed modifications prior to award would have meant initial manufacture of all helicopters, rather than most helicopters, with the needed modifications, with an attendant cost saving. Even so, the identification of the need for modifications not long after award minimized the cost difference incurred by post-award need identification in lieu of pre-award need identification.

B. CONTROVERSY AND NEGATIVE PUBLICITY

Shortly after the release of the IOT&E report, there was public controversy and negative publicity concerning the purchase of the UH-72A helicopters. This section describes the reasons why these events occurred.

1. Negative Publicity

Following the issuance of the IOT&E report in July 2007, there was negative publicity about the UH-72A helicopters. This negative publicity focused primarily on the shortcomings of the UH-72A helicopters described in that report and secondarily on the fact that the contract for them was not awarded to an American concern.

a. Shortcomings

Articles were posted on the Internet with such titles as “New Army chopper found unsafe” (Davis 2007), “LUH Taking Fire” (Carroll 2007), “Army Defends Light Chopper Amid Warnings it Could Fail” (Tiron 2007), and “Army will spend millions fixing new billion-dollar chopper” (Eslocker 2007).

These articles were posted several months after the release of the IOTE report in July 2007, which stated that although operationally effective and more capable than their predecessors, the UH-72As were not operationally suitable. This was shortly after massive California wildfires in late October 2007. These wildfires highlighted the finding in the IOTE report that because of their limited load-bearing capacity, the UH-72As are not suitable for fighting fires. Several of the above-cited articles discuss the concern expressed by Representative Duncan Lee Hunter (R-CA), then the ranking member of the House Armed Services Committee (HASC), about this non-suitability for fire-fighting—in addition to the various other shortcomings discussed in the IOTE ("Duncan Hunter" (Wikipedia) 2014). According to Davis (2007), he was unimpressed by the argument that fire-fighting was not one of the intended uses of the UH-72As, saying that the military should purchase versatile aircraft. The above-cited articles report his recommendation that the LUH acquisition program be terminated, and that the Army buy additional Black Hawks, which he considered more capable.

b. Award to a Foreign Concern

Congressman Hunter's opposition to the UH-72A acquisition was based not only upon their shortcomings, but because he was a staunch advocate for protectionism, it was also based on the fact that the contract for the LUHs was awarded to a foreign concern ("Duncan Hunter" (Wikipedia) 2014; Gansler and Lucyshyn 2008, 33; Carroll 2007). He was not alone in this mindset. While most comments posted in response to the various above-cited online articles focused on the technical shortcomings, particularly the overheating problem, the posted comments also included such remarks as, "We are spending $$$ on European Helicopters when our economy is tanking???...Why aren't domestic companies building these?!?!" and "Domestic birds not good enough?" (These comments were posted in response to Davis' "New army chopper overheats" article).

The 2008 Gansler and Lucyshyn report stated that award of the LUH contract to a non-American company was "significant[,]" noting that programs that had previously been the exclusive purview of American suppliers were "now opening to overseas competitors[,]" thereby increasing the amount of competition from that provided by the dwindling pool of domestic military aircraft manufacturers (pp. 31, 32 (quotation on each page)). The report describes the cultural resistance to this change, i.e., awarding the contract to a foreign-owned company rather than to a domestic one, and cites Representative Hunter's recommendation to terminate the acquisition of the UH-72As and purchase Black Hawks instead (p. 33).

The Gansler and Lucyshyn report discusses the effect of globalization on DOD's effort to modernize, saying, "Globalization has helped promote economic and security-based relations around the world…" (pp. 1–2). The sale of UH-72As to Thailand (described in paragraph C.1.*b*.(4) of Chapter II) is an example of such promotion of economic and security-based relations between countries. Gansler and Lucyshyn further stated that "it is likely that many of the [technological] advances will occur outside of U.S. borders" (pp. 1–2).

2. Lessons Learned

The lessons learned from the controversy and negative publicity generated during the first few months following award of the UH-72A contract are the following:

a. In Some Cases, Even a Well-Conceived and Mostly Successful Acquisition Decision Can Generate Negative Publicity, Both Warranted and Unwarranted

While some of the critics' concerns of the program were legitimate, such as the lack of space in the MEDEVAC helicopters and the problems of overheating and sand ingestion, the attitude evidenced by Representative Hunter and those who shared his view that the UH-72A acquisition was fatally flawed and should be terminated was unwarranted.

(1) The identified flaws did not warrant terminating the program because the flaws were susceptible to easy correction.

The problems described in the IOTE report could be, and were, readily and successfully addressed, and the remedies for the problems were implemented early in the manufacturing process, before most of UH-72As were built. In addition to the remedies being effective and timely, they were implemented without incurring exorbitant cost.

(2) Lack of fire-fighting capability did not warrant program termination.

Because the Army had other helicopters, such as Black Hawks and Chinooks, that were well-suited for fire-fighting, and because the Lakotas were purchased primarily for purposes other than fire-fighting, the limited fire-fighting capability of the Lakotas was a far less serious concern that the Lakotas' critics contended it was.

(3) Award to a foreign concern did not create the problems one might expect to result from such an award.

It is logical that a lawmaker who is a staunch advocate of Buy-American legislation, as Representative Hunter was, would have serious concerns about award of a major defense contract to a foreign company. Such concerns could include:

(a) Loss of American jobs to overseas firms

As discussed in paragraph C.3.*b* of Chapter II, although most of the manufacturing process for the initially delivered helicopters took place in Germany, within three years of contract award, the entire manufacturing process was taking place in the United States. As discussed in paragraph C.3.*d* of Chapter II, manufacture of the Lakotas has generated hundreds of jobs in Mississippi, where the manufacturing plant is located. Loss of American jobs was therefore proven to not be a valid concern with respect to award of the LUH contract to a foreign company. In fact, this particular foreign-awarded contract actually generated American jobs.

(b) Trust that a non-American firm would place American interests in the forefront and deliver manufactured goods that would provide the maximum possible benefit to their users in the American military

As discussed throughout this report, in most respects, most users of the UH-72As have been very satisfied with them, and they have found their acquisition to be highly beneficial. While one might question the commitment of a non-American firm to uphold American interests, such a concern has proven to be moot with respect to the LUH acquisition.

(4) The supporters of program termination appeared to not consider the potential benefits of a foreign award.

While the loss of American jobs and the lack of confidence in an overseas firm's commitment to American interests could be initial legitimate concerns with respect to awarding a contract to an overseas firm, in the absence of evidence that these were not valid concerns, Representative Hunter apparently did not take into account the potential benefits of award to a foreign concern which are described in the Gansler and Lucyshyn report. These benefits include increased competition, an important consideration, given the consolidation of the U.S. defense industry following the end of the cold war and its consequent limitation on competition. Another benefit is that award to foreign concerns allows DOD to take advantage of technology developed by foreign firms, as well as that developed by domestic concerns.

b. A Successful Program Can Negate Initial Negative Publicity and Can Challenge the Cultural Bias that Generated it

When the negative publicity occurs because the acquisition program challenges a cultural mind-set, if the acquisition is successful overall, the success of that acquisition can challenge that cultural mind-set and establish a precedent for future acquisition programs to similarly challenge that cultural mind-set. The UH-72A acquisition program has shown that award of a large defense contract to a foreign concern can be successful and can comply with Buy-American requirements. In addition, it has shown that rather than taking away American jobs, such an award can actually generate American jobs. It has also shown that a foreign manufacturer can and will produce equipment of maximum utility for its users. Because of the Army's overall positive experience with the UH-72As, foreign firms that receive major defense contracts in the future may face less initial opposition on their being foreign than did the UH-72A acquisition firms.

c. Negative Publicity, if it Occurs, Will Not Necessarily be Long-Lasting or Devastating

Other than the September 2008 Gansler and Lucyshyn report, the author has not seen any mention of the issue of the LUH contract being awarded to a foreign concern in any report or article published or posted after January 2008. Furthermore, as discussed in paragraph A.2.*b* of this chapter, despite Representative Hunter’s recommendation in 2007 that the UH-72A acquisition program be terminated, in subsequent years, members of the HASC, of which he had served as chairman and as ranking member, cited the overall success of the UH-72A, noting its “excellent performance” (DOD Appropriations Bill, Appropriations Committee Report, 2013; May 25, 2012; p. 117).

With a few exceptions, such as the posting of “Fielding the UH-72A Lakota” by Daron Hankins, most reports and articles published or posted after the end of 2007 reported favorably on the UH-72A. Some of these favorable articles are referenced in paragraph E.1.*b* of Chapter V.

THIS PAGE INTENTIONALLY LEFT BLANK

VII. CONCLUSIONS

The UH-72A acquisition program is the Army's first major acquisition of commercially available helicopters subsequently modified for military use (Davis 2007). As of May 14, 2014, 300 helicopters had been delivered. The UH-72A acquisition program as previously envisioned is now more than 90% complete. As such, the program's successes and problems are clearly apparent, and the application to other major military acquisitions of the lessons learned from those successes and problems, can be readily assessed.

The successful aspects of this acquisition program and the lessons learned from these successes were described in Chapter V. The problems encountered during the course of the UH-72A acquisition program and the lessons learned thereby were described in Chapter VI. This chapter summarizes the information in earlier chapters and states conclusions based on thereon.

A. THE SUCCESSES OF THE UH-72A ACQUISITION PROGRAM

The UH-72A acquisition program was successful in most respects. This section of Chapter VII summarizes some of the successes of the program and the factors contributing to the successes. It also summarizes the application of the lessons learned from these successes to other MDAPs.

1. Program Successes

The successes of the UH-72A acquisition program include, but they are not limited to, those described in paragraphs *a* through *e*.

a. Rapid Acquisition, Fielding, and Materiel Release

1. Despite a 100-day delay in the start of the manufacturing process because of two award protests, the first UH-72A was delivered less than six months after contract award ("Rotorcraft report" 2007).

2. The first operational unit was equipped with UH-72As less than 11 months after contract award, an unusually rapid achievement for a new aircraft.

3. Full materiel release also took place less than 11 months after contract award (AMCOM granted this upon initial request, which was the first time AMCOM had done so for any Army aviation system).

b. Adherence to Schedule and Budget

All UH-72As have been delivered on-time or ahead of schedule. Although the modifications to the helicopters—both the MEPs and the modifications made to correct identified problems—have increased the costs of the helicopters somewhat, based on the PAUC and APUC metrics, the LUH acquisition program is on-budget.

c. Acquisition of Equipment Providing a High Degree of Utility without Paying an Exorbitant Cost

(1) Most users have found the UH-72As easy to pilot and have commented favorably on their capabilities.

(2) Addition of MEPs made possible the tailoring of the helicopters to a variety of uses, and the addition of advanced technology.

The UH-72As have been uniquely tailored to a variety of uses, including medical evacuation, training, and security and support, by the addition of various MEPs. Incorporation of these MEPs also made possible the addition of equipment with advanced technology (developed at contractor, not at government, expense) to the helicopters several years after contract award. The UH-72As equipped with S&S MEP were the first Army helicopters to be equipped with touch screen displays and soft keyboards.

(3) Choosing adequate technical capability at a lower price over greater technical capability at a higher price resulted in cost savings while meeting the government's needs.

By eschewing during the source selection process the most technically capable, but also the most expensive, light utility helicopters, AMCOM avoided over $867 million in purchase costs, but still acquired helicopters that, in most respects, have met the Army's needs very well. These hundreds of millions of dollars in savings are in addition to the savings realized by acquiring commercial, non-developmental helicopters in lieu of developing new helicopters.

d. Economic Stimulus

The manufacture of the UH-72As in Columbus has provided an economic stimulus to Mississippi, a state particularly in need of economic stimulus.

e. Increase in the Available Pool of Military Aircraft Manufacturers, Thereby Increasing Competition, and Partially Reversing the Trend of Consolidation in the Defense Industry

There are now far fewer defense contractors than existed at the end of the cold war. The award of the UH-72A contract to a foreign-owned company which has an American subsidiary and has manufacturing plants in the United States has increased the pool of available firms which can manufacture equipment for America's defense needs. Also, the UH-72A's relatively smooth progress from contract award to initiation of production and delivery demonstrated to foreign offerors that DOD is a viable market, thereby helping to foster continued increases in competition.

2. Factors Contributing to Program Success

The following factors contributed to the successes of the UH-72A acquisition program:

a. Purchase of a Commercial, Non-developmental Item

The acquisition of commercially available equipment benefitted the light utility helicopter acquisition program in the following ways:

1. Obviation of the need for expenditures of time and money for development of new technology.

2. The availability of competition, which allowed for a choice of several means of meeting the Army's requirements, and which encouraged the offerors to moderate their prices and to offer the best technology they could provide for their offered prices.

3. The amortization of the contractor's costs for development, manufacturing, and logistics support over the base of the contractor's private and government customers, thereby diminishing costs to the government for these expenses.

4. The acquisition of mature technology which was developed at contractor, not at government, expense.

5. Obviation of the need for extensive time expenditure to ramp-up production because the UH-72A helicopters were very similar to helicopters that the manufacturer was already producing. The expeditious commencement of production contributed to the rapid fielding of these helicopters.

6. Allowance of the use of a fixed-price contract, which minimizes risk to the government and minimizes administrative burden to both the government and the contractor.

b. Cooperation between All Stakeholders

As discussed in Section A of Chapter II and Section B of Chapter V, cooperation between the stakeholders resulted in clear definition of requirements, incorporating lessons learned in the field, which resulted in production of equipment packages well-suited to equipping the helicopters for their intended uses and for meeting users' needs.

c. Use of an Evolutionary Acquisition Strategy to Tailor the Helicopters for Varied Purposes and to Incorporate Appropriate New Technology

The UH-72A helicopters as they were originally manufactured were not well-suited for deployment in all their intended locations or for all of their intended purposes. For example, they were not designed for use in desert environments, and they lacked equipment needed for law enforcement and for use as training helicopters. The addition of EIBFs addressed the first problem, and the addition of the S&S and CTC MEPs made the UH-72As having those MEPs uniquely suited for law enforcement and for training, respectively. In addition, the addition of the S&S MEP made possible the incorporation of state-of-the art technology which greatly enhanced the utility for the intended purposes of the helicopters so equipped.

d. Avoidance of Requirements Creep

Requirements creep was avoided because of clear definition of requirements and the existence of a controlled process for incorporating changes.

e. Careful Documentation of the Source Selection Decision

The thorough and detailed source selection documentation allowed the GAO to uphold the contracting officer's source selection decision, thereby minimizing the delay to the commencement of the manufacturing process.

3. Application of Lessons Learned to Other Major Defense Acquisition Programs

The lessons learned from the Army's experience with the acquisition of LUHs as a commercial item highlight the benefits of acquiring commercially available equipment in lieu of developmental items, when commercially available equipment will meet DOD's needs. The UH-72A acquisition also shows that commercially available equipment cannot meet all of DOD's needs.

a. Acquisition of Commercially Available Equipment Offers Several Advantages over Acquisition of Developmental Items

Although commercially available equipment does not always meet users' requirements, when such equipment does meet users' requirements (or can be tailored to meet them), acquisition of commercial items, or at least, of non-developmental items, offers several advantages over acquisition of developmental items. These advantages were described in the above paragraph A.2.*a* of this chapter. Therefore, when commercially available items (or non-developmental items) are available that will meet the users' needs, such items should be purchased in lieu of developmental items.

b. Commercial/Non-developmental Items Can be Tailored to Multiple Uses

Even when commercial or non-developmental items do not meet the requirements for their intended uses in the state in which they are initially manufactured, in some cases, these items can be tailored to meet such requirements. In fact, such items can sometimes be tailored to meet requirements for multiple, diverse, non-related uses. The successful addition of MEPs to the UH-72As to uniquely equip them for multiple uses, such as medical evacuation, law enforcement, rescue, training, and transportation of key personnel, showed that this is so.

Thus, an inexact match between the capabilities of a commercial or non-developmental item as manufactured, and the capabilities the item must have in order to be successfully deployed for its intended purpose, does not automatically obviate the possibility of commercial or non-developmental items being acquired for purposes for which they are unsuited in their originally manufactured state.

One lesson that can be applied to other major defense acquisition programs is that purchasing commercial or non-developmental items that do not exactly meet users' requirements, and subsequently tailoring these items to meet users' requirements, can in some cases be a workable and cost-effective acquisition strategy. Another lesson is that in lieu of purchasing multiple types of equipment, each type for a different purpose, agencies can purchase one basic model of equipment and subsequently tailor the basic model to multiple uses. An advantage of this acquisition strategy is that in some cases, by the time the tailored package is purchased, it can allow the acquiring agency to take advantage of new technology that was unavailable at the time the basic model of the equipment was manufactured, but that has since been developed.

There is a caveat to this conclusion. The caveat is that commercial items are not suitable for all purposes, and there are uses for which it is impractical to tailor commercial items. Frank Kendall, the Undersecretary of Defense for Acquisition, Logistics and Technology stated in June 2103 that the modifications that would be needed to make UH-72As suitable for deployment under combat conditions were "presently unaffordable" ("Eurocopter UH-72 Lakota" (Wikipedia) 2014). "Fleet-wide combat modifications would reportedly cost $780 million" (an approximately 30% increase) and would increase the weight of each helicopter by about 20%, thereby increasing the fuel costs needed to operate them ("Eurocopter UH-72 Lakota" (Wikipedia)).

c. Commercial Non-developmental Items are Not Suitable for All Military Needs

As previously stated, there are situations in which commercial and non-developmental items cannot meet military needs, especially for combat purposes. Also, there are situations in which it is necessary for the U.S. military to acquire developmental equipment or software in order to have equipment or software that is technologically superior to that possessed by America's adversaries. Even in situations in which it is necessary to acquire developmental items, however, the other lessons learned from the Army's successes with the UH-72A acquisition can still be applied to such acquisitions. These lessons include:

1. Close collaboration among all stake holders facilitates clear definition of requirements.

2. Avoidance of requirements creep, which is facilitated by clear definition of requirements, contributes greatly to avoidance of cost overruns and production delays.

3. It is wise to use an evolutionary acquisition strategy. This allows for lower initial expenditure, and it allows the acquiring agency to take advantage of technology developed subsequent to initial acquisition of equipment or software.

4. Careful documentation of the source selection decision is very important. Such documentation facilitates GAO's ability to uphold a contracting officer's source selection decision in the face of an award protest. The current constraints on military budgets are likely to continue. These constraints limit the U.S. military's ability to purchase new equipment, thereby limiting manufacturers' opportunities to be awarded contracts for major defense acquisitions. In such an environment, manufacturers are particularly eager to be awarded these high-dollar value contracts, and unsuccessful offerors are particularly likely to protest awards to successful offerors. This situation makes careful documentation of the source selection decision especially important. Avoidance of successful protests obviates the expenditures of time and money needed to re-initiate acquisitions following successful protests.

5. In some, although not all, cases, having price, rather than technical capability, be the most important source selection factor, can result in the acquisition of equipment that meets the users' needs more than adequately, while saving money by eschewing the acquisition of more expensive equipment that has technical capabilities in excess of the users' needs.

B. THE PROBLEMS ENCOUNTERED DURING THE UH-72A ACQUISITION PROGRAM

Although the UH-72A acquisition program was successful in most respects, a few problems were encountered. This section summarizes these problems and the factors that contributed to them. It also summarizes the application of the lessons learned from these problems to other MDAPs.

1. The Problems Encountered During the Course of the UH-72A Acquisition

The problematic aspects of the UH-72A acquisition are far fewer than the program successes. Even so, problems did occur.

a. Operational Unsuitability of the Initially Delivered Aircraft

This operational unsuitability resulted largely from the UH-72As not having been designed for deployment in a desert environment, resulting in the problems of overheating and the ingestion of sand and other foreign objects into the helicopter engines. Additional aspects of the operational unsuitability were inadequate space in the MEDEVAC configuration and an inadequate communication system.

b. Negative Publicity

The negative publicity resulted partly from the operational unsuitability and partly from some parties' disapproval of a major defense contract being awarded to a foreign concern.

2. Factors Contributing to Problems Experienced

To an extent, the factors contributing to the problems were beyond the Army's control.

a. Not Performing Pre-award Field Testing under Conditions in which the Equipment Would be Used

Although the helicopters were flight-tested prior to source selection, these test flights did not take place in a desert environment. Thus, the unsuitability of the UH-72As for deployment in such environments was not identified until after contract award and delivery of the first few helicopters.

b. Cultural Biases

The cultural mindset of the U.S. military establishment and some lawmakers at the time of contract award was that major defense purchases should be awarded to American, not to foreign, manufacturers.

3. Application of Lessons Learned to Other Major Defense Acquisition Programs

Although the LUH acquisition program had very few problems, those few problems provide lessons which are applicable to other MDAPs.

a. Appropriate Field Testing of Equipment

When it is practicable to do so, equipment should be field-tested prior to purchase under the conditions in which it is intended to be used. When not practicable to do so, such testing should take place as soon as possible after purchase. When this testing takes place early in the manufacturing process, any needed modifications to the equipment can be identified and implemented before most of the equipment has been manufactured, thereby obviating the expense of retrofitting a large percentage of the equipment.

b. Acquisitions Can be Successful, Despite Initial Problems

(1) Initial operational unsuitability does not automatically mean program failure. The causes of operational unsuitability can sometimes be readily corrected with appropriate modifications to the equipment, resulting in an acquisition program that is successful in most respects.

(2) Negative publicity about a program can sometimes be short-lived. This is particularly true when the problems generating the negative publicity are addressed in an effective and timely way at a reasonable cost.

(3) When the negative publicity occurs because the acquisition program challenges a cultural mind-set (in the case of the UH-72A acquisition,

awarding the contract to a foreign concern and deviating from the standard practice of awarding major defense contracts to domestic concerns), if the acquisition is successful overall, the success of that acquisition can challenge that cultural mind-set and establish a precedent for future acquisition programs to make the same challenge to that cultural mind-set. Issues which are likely to be concerns when a large defense contract is awarded to a foreign firm, such as loss of American jobs and receipt of equipment of less than optimal utility for its users, did not materialize during the course of the UH-72A contract. Because of that, and because the UH-72A acquisition program was an overall success, it is possible that in the future, foreign manufacturers may have an easier time competing for award of major American defense contracts, with resultant increased competition and availability of commercially developed technology.

C. FINAL CONCLUSION

In conclusion, as the Army's first major acquisition of commercially available helicopters subsequently modified for military use, the LUH acquisition program has clearly demonstrated the benefits of acquiring commercially available equipment and subsequently tailoring it for diverse needs. This program has also demonstrated that commercial items are not always an exact match for the U.S. military's needs in their initially manufactured state; they may require tailoring in order to be suitable for their intended uses; and there are limitations to the extent to which commercial items can feasibly be tailored. Such limitations are often particularly applicable to equipment used for combat.

In addition to demonstrating that acquisition of commercially available (or at least of non-developmental) items is a wise acquisition strategy, when commercial items will meet the U.S. military's needs, the Army's experiences with the LUH acquisition program highlight the importance of following established recommended acquisition practices. These practices include fostering close collaboration among all stake holders, clear definition of all requirements, avoidance of requirements creep, careful documentation of the source selection decision, and field testing equipment prior to purchase (or as soon as feasible after purchase) under the conditions in which it will be deployed.

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF REFERENCES

Acronym Finder. Accessed November 21, 2014. http://www.acronymfinder.com/NV.html.

"Airbus Group Delivers 300th on-Time, on-Budget UH-72A Lakota Helicopter to U.S. Army" [May 14, 2014, Airbus press release]. http://www.uh-72a.com/news/archive.asp.

"Airbus Group, Inc." Last modified October 29, 2014. Accessed November 21, 2014. http://en.wikipedia.org/wiki/EADS_North_America.

"Airbus Helicopters." Last modified May 26, 2014. Accessed November 21, 2014. http://en.wikipedia.org/wiki/Eurocopter.

Airbus Helicopters. Accessed November 21, 2014. http://airbushelicoptersinc.com/about_us/the_industry_leader.asp.

"Airbus Helicopters, Inc." Last modified February 12, 2014. Accessed November 21, 2014. http://en.wikipedia.org/wiki/American_Eurocopter.

American Eurocopter. Accessed November 21, 2014. http://www.eurocopterusa.com/about_us/the_industry_leader.asp.

"American Eurocopter Receives FAA Production Authority for the U.S. Army UH-72A Lakota and EC145 Commercial Helicopters" [August 29, 2007, EADS press release]. http://www.uh-72a.com/news-feature-story/2007/news_feature_2007_08_29.asp.

Answers. Accessed November 22, 2014. http://www.answers.com/topic/human-factors-engineering-1.

"Armed Aerial Scout." Last modified November 15, 2014. Accessed November 20, 2014. http://en.wikipedia.org/wiki/Armed_Aerial_Scout.

"Army Medical Department (AMEDD) MEDEVAC Innovations 1991–2011" [Posted February 23, 2012]. http://medevacmatters.org/2012/02/23/army-medical-department-amedd-medevac-innovations-1991–2011/.

Army Modernization Strategy 2008. 2008: A-15. United States Army. http://www.dtic.mil/dtic/tr/fulltext/u2/a494621.pdf.

"Ask a Flight Instructor." Accessed November 22, 2014. http://www.askacfi.com/3565/useful-load-vs-payload.htm.

"At the Army Aviation Association Show, Pilots Applaud the UH-72A Lakota" [May 6, 2009, EADS feature story]. http://www.uh-72a.com/news-feature-story/2009/05–06–09-army-aviation-association-show.asp.

"Autopilot." Last modified November 8, 2014. Accessed November 21, 2014. http://en.wikipedia.org/wiki/Autopilot.

"Autorotation." Last modified October 17, 2014. Accessed November 22, 2014. http://en.wikipedia.org/wiki/Autorotation_(helicopter) .

"Aviation Fuel." Last modified October 17, 2014. Accessed November 22, 2014. http://en.wikipedia.org/wiki/Aviation_fuel.

"Avionics." Last modified October 12, 2014. Accessed November 22, 2014. http://en.wikipedia.org/wiki/Avionics.

"Award Synopsis W58RGZ-06-C-0194" [Posted in FedBizOpps June 30, 2006; archived July 15, 2006]. https://www.fbo.gov/index?s=opportunitymode=form&tab=core&id=3a06a90c10a3842305f37e6ad7ff20a8&_cview=0.

"Bell ARH-70 Arapaho." Last modified November 19, 2014. Accessed November 20, 2014. http://en.wikipedia.org/wiki/Bell_ARH-70_Arapaho.

"Bell Helicopter Bell 205 (UH-1)." Accessed November 22, 2014. http://www.flugzeuginfo.net/acdata_php/acdata_205_en.php.

"Bell OH-58 Kiowa." Last modified November 17, 2014. Accessed November 20, 2014. http://en.wikipedia.org/wiki/Bell_OH-58_Kiowa.

"Bell UH-1 Iroquois." Last modified October 29, 2014. Accessed November 22, 2014. 2014. https://en.wikipedia.org/wiki/Bell_UH-1_Iroquois.

"Bell UH-1 Iroquois (Huey) Specs." Accessed November 22, 2014. http://home.onthenet.com.au/~gmylne/hueyspecs1.htm.

"Bell UH-1H Iroquois 'Huey' Smokey III" [Smithsonian National Air and Space Museum]. Accessed November 22, 2014. http://airandspace.si.edu/collections/artifact.cfm?id=A19960005000.

Blakeman, Seth, Anthony Gibbs, and Jeyanthan Jeyasingam. 2008. "*Study of the Mine Resistant Ambush Protected (MRAP) Vehicle Program as a Model for Rapid Defense Acquisitions*" [MBA Report]. December 2008. Monterey, CA: Naval Postgraduate School.

Bledsoe, Sophia. 2013. "Huntsville Mayor Flies on Lakota Helicopter." (January 11, 2013). http://www.army.mil/article/94164/.

———. 2011."New Lakota Variant Packs Punch for Guard" [September 29, 2011]. http://www.uh-72a.com/news-external-news/2011/9–29–2011.asp.

Blottenberger, Dan. 2010. "Army Shows off Newest Helicopter for Distinguished Guests." *Stars and Stripes* (September 10, 2010). http://www.stripes.com/news/europe/germany/army-shows-off-newest-helicopter-for-distinguished-guests-1.117746.

"Blue Force Tracking." Last modified May 23, 2014. Accessed November 22, 2014. http://en.wikipedia.org/wiki/Blue_Force_Tracking.

"Boeing-Sikorsky RAH-66 Comanche." Last modified October 6, 2014. Accessed November 20, 2014. http://en.wikipedia.org/wiki/Boeing-Sikorsky_RAH-66_Comanche.

Bower, Ron. 2006."Flying the EC145." *Rotor & Wing* (April 1, 2006). http://www.aviationtoday.com/rw/commercial/ems/1496.html.

Brackin, Kentavist. 2013. "Last AF Huey Starts New Mission with the NY Police Force." (June 12, 2013). http://www.helis.com/database/news/uh-1h_usaf/.

Brashear, James. 2008a. *UH-72A Lakota—A Commercial Helicopter Serving in a Military Role* [Personal Communication; draft article for Army Aviation].

———. 2008b. *UH-72A Lakota Update—Fielding the Light Utility Helicopter* [Personal Communication; article published in June 30, 2008 edition of Army Aviation, but no longer available online.]. Army Aviation.

———. 2008c. *UH-72A Main Rotor Blade Coating Project Plan*. https://www.us.army.mil/suite/designer;jsessionid=512422024A9B0405D666763AA2E06744.appd06_2.

———. 2009. *UH-72A Lakota—on Schedule, on Cost and Meeting Performance Expectations* [Personal Communication; draft article for Army Aviation].

Brashear, James and Kirk Ringbloom. 2007. *UH-72A Lakota—Exceeding Expectations* [Personal Communication; draft article for Army Aviation].

"Brigadier General Neil L. Thurgood United States Army." Accessed November 23, 2014. http://www.msl.army.mil/Documents/peoBioThurgood.pdf.

Bristol, David. *UH-72A Lakota: On Time, on Budget & Performing* 2010. [Presented at April 2010 Annual Forum of Army Aviation Association of America (AAAA); presentation no longer available at that website]. http://www.quad-a.org/index.php?option=com_co ntent&view=article&id=316&Itemid=67.

Bristol, David, and Art Medellin. 2011. *Light Utility Helicopters Product Office Brief* [Presented at April 2011 Annual Professional Forum and Exposition of Army Aviation Association of America (AAAA); http://www.quad-a.org/index.php?option=com_co ntent&view=article&id=316&Itemid=67.

Brownlee, Lee. 2004. *Briefing on the Restructure and Revitalization of Army Aviation*: Office of the Secretary of the Army; February 23, 2004. http://www.defense.gov/transcripts/transcript.aspx?transcriptid=2122.

Bruce, Christopher. 2014. "Oklahoma Army National Guard Bombards Blaze in Support Mission" [May 6, 2014]. http://www.nationalguard.mil/News/ArticleView/tabid/5563/Article/8844/oklahoma-army-national-guard-bombards-blaze-in-support-mission.aspx.

"Building on Success: The UH-72A Continues its Rapid Fielding with the U.S. Army" [October 5, 2009, EADS feature story]. http://www.uh-72a.com/news-feature-story/2009/10–05–09-ausa-briefing.asp.

Bureau of Labor Statistics. Accessed November 22, 2014. http://www.bls.gov/web/laus/laumstrk.htm.

Carey, Bill. 2014. "President's FY2015 Defense Budget Retires OH-58 Kiowas." *Ainonline* (March 5, 2014). http://www.ainonline.com/aviation-news/ain-defense-perspective/2014–03–05/presidents-fy2015-defense-budget-retires-oh-58-kiowas.

Carroll, Ward. "LUH Taking Fire." *Defensetech* (November 13, 2007). http://defensetech.org/2007/11/13/luh-taking-fire/.

Chavanne, Bettina. 2008. "EADS Addresses Controversy over Lakota Light Utility Helo" [Article no longer available]. *Aerospace Daily & Defense Report* (January 29, 2008). http://www.aviationweek.com/aw/generic/story_channel.jsp?channel=defense&id=news/VIDLAKOTA.xml&headline=EADS+Addresses+Controversy+Over+Lakota+Light+Utility+Helo.

Cross, Stephanie. 2008. "Louisiana Guard Receives High-Tech Helicopters" [Posted July 8, 2008 on Louisiana National Guard's website, but no longer available]. http://www.nationalguard.com/news/2008/jul/08/louisiana-guard-receives-high-tech-helicopters.

Davis, Aaron. 2007. “New Army Chopper Overheats” (November 9, 2007; also posted as “New Army Chopper Found Unsafe”). http://www.ar15.com/forums/t_1_5/638169_.html.

Defense Acquisition University’s Glossary of Defense Acquisition Acronyms and Terms. 2012. Accessed November 20, 2014. https://dap.dau.mil/glossary/pages/2464.aspx.

Defense Acquisitions—Assessments of Selected Weapon Programs. March 2007. Government Accountability Office. http://www.gao.gov/new.items/d07406sp.pdf.

Defense Acquisitions—Assessments of Selected Weapon Programs. March 2008. Government Accountability Office. http://www.gao.gov/new.items/d08467sp.pdf.

Defense Acquisitions—Assessments of Selected Weapon Programs. March 2013. Government Accountability Office. http://www.gao.gov/assets/660/653379.pdf.

Department of Defense Appropriations Bill, 2013: Report of the Committee on Appropriations [May 25, 2012, 117]. 2012. Report 112–493 [to accompany HR 5856]: Title III, Procurement. http://www.gpo.gov/fdsys/pkg/CRPT-112hrpt493/pdf/CRPT-112hrpt493.pdf.

Department of Defense Budget, Fiscal Year 2009, Procurement (P-1) Programs. Published by the Office of the Under Secretary of Defense (Comptroller). (February 2008). http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2009/fy2009.

Department of Defense Budget for Fiscal Year 2010, Procurement (P-1) Programs. Published by the Office of the Under Secretary of Defense (Comptroller). (May 2009). http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2010/fy2010_p1.pdf.

Department of Defense Budget, Fiscal Year 2011, Procurement (P-1) Programs. Published by the Office of the Under Secretary of Defense (Comptroller). (February 2010). http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2011/fy2011_p1.pdf.

Department of Defense Budget, Fiscal Year 2012, Procurement (P-1) Programs. Published by the Office of the Under Secretary of Defense (Comptroller). (February 2011). http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2012/fy2012_p1.pdf.

Department of Defense Budget, Fiscal Year 2013, Procurement (P-1) Programs. Published by the Office of the Under Secretary of Defense (Comptroller). (February 2012). http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2013/fy2013_p1.pdf.

Department of Defense Budget, Fiscal Year 2014. (April 2013). http://comptroller.defense.gov/defbudget/fy2014/fy2014_p1.pdf.

Department of Defense Budget, Fiscal Year 2014, Procurement (P-1) Programs. Published by the Office of the Under Secretary of Defense (Comptroller). (April 2013). http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2014/fy2014_p1.pdf.

Department of Defense Dictionary of Military and Associated Terms. 2010. http://www.dtic.mil/doctrine/new_pubs/jp1_02.pdf.

"Department of Defense Releases Selected Action Reports" [April 7, 2008, U.S. Department of Defense press release]. Accessed November 23, 2014. http://www.defense.gov/Releases/Release.aspx?ReleaseID=11812.

Department of the Army Procurement Programs, Committee Staff Procurement Backup Book, Fiscal Year (FY) 2008/2009 Budget Submission, Aircraft Procurement, Army, Exhibit P-40, Budget Item Justification Sheet. (February 2007). http://asafm.army.mil/Documents/OfficeDocuments/Budget/BudgetMaterials/fy08–09/pforms//aircraft.pdf.

DOD Acquisition Outcomes—A Case for Change. November 15, 2005. Government Accountability Office. http://www.gao.gov/new.items/d06257t.pdf.

DOD Instruction 5000.02, Operation of the Defense Acquisition System. December 2008. Encl. 2 (Procedures), Para. 2 (Evolutionary Acquisition): p.13. http://www.acq.osd.mil/asda/docs/DOD_instruction_operation_of_the_defense_acquisition_system.pdf.

DOD Wastes Billions of Dollars through Poorly Structured Incentives. April 5, 2006. Government Accountability Office. http://www.gao.gov/assets/120/113410.pdf .

Dransfield, Tiffany, and Michael Woods. 2004. "The Vascular Flora of Dale County, Alabama." *Southeastern Naturalist*. http://www.jstor.org/discover/10.2307/3878077?uid=3739704&uid=2129&uid=3739936&uid=2&uid=70&uid=4&uid=3739256&sid=21103572835523.

Drwiega, Andrew. 2012. "Armed Aerial Scout: Reviving a Lost Generation." *Rotor & Wing* (December 1, 2012). http://www.aviationtoday.com/rw/topstories/Armed-Aerial-Scout-Reviving-a-Lost-Generation_78026.html.

Dubiel, Jean. 2009. "New MEDEVAC Fleet Lands at Fort Polk" [Dated September 24, 2009]. Last modified July 22, 2011. http://www.army.mil/article/27627/.

Dubois, Thierry. 2012. "Latest EuroNav Offers Dual Map Display." *Ainonline* (February 10, 2012). http://www.ainonline.com/aviation-news/hai-convention-news/2012–02–10/latest-euronav-offers-dual-map-display.

"Duncan Hunter." Last modified November 12, 2014. Accessed November 23, 2014. http://en.wikipedia.org/wiki/Duncan_Hunter.

"EADS." Last modified November 7, 2014. Accessed November 20, 2014. http://en.wikipedia.org/wiki/EADS.

"EADS North America Awarded $181.8 Million Army Contract Option for 34 UH-72A Lakotas" [November 14, 2012, EADS press release]. http://www.uh-72a.com/news-press-releases/2012/2012–11–14.asp.

"EADS North America Awarded $212 Million Production Contract for 39 UH-72A Lakota Helicopters" [January 10, 2012, EADS press release]. http://www.uh-72a.com/news-press-releases/2012/2012–1-10.asp.

"EADS North America Begins Deliveries of Lakota Helicopters with an Advanced Mission Equipment Package" [October 10, 2011, EADS press release]. http://www.uh-72a.com/news-press-releases/2011/2011_10_10.asp.

"EADS North America Begins Deliveries of U.S. Army UH-72A Helicopters Produced on the U.S. Final Assembly Line Process at Mississippi" [October 7, 2008, EADS press release]. http://www.uh-72a.com/news-press-releases/2008/2008_10_07.asp.

"EADS North America Begins UH-72A Light Utility Helicopter Deliveries to the U.S. Army National Guard" [June 7, 2008, EADS press release]. http://www.uh-72a.com/news-press-releases/2008/2008_06_07.asp.

"EADS North America CEO Sean O'Keefe Issues Statement Regarding Proposed UH-72A Lakota Helicopter Program Reduction" [April 11, 2013, EADS press release]. http://www.uh-72a.com/news-press-releases/2013/2013–4-18.asp.

"EADS North America Completes a Strong Year of Achievement for the U.S. Army's UH-72A Light Utility Helicopter" [December 11, 2007, EADS press release]. http://www.eadsnorthamerica.com/1024/en/breaking_news/2007%20Press%20Releases/2007_12_11_UH-72A_Lakota.html.

"EADS North America Delivers 200th UH-72A Lakota Light Utility Helicopter to U.S. Army" [March 12, 2012, EADS press release]. http://www.uh-72a.com/news-press-releases/2012/2012–3-1.asp.

"EADS North America Delivers First H-72A Training Helicopter to the U.S. Navy" [November 12, 2009, EADS press release]. http://www.uh-72a.com/news-press-releases/2009/2009_11_12.asp.

"EADS North America Increases its UH-72A Lakota Helicopter Delivery Rate to Two Aircraft Per Month for the U.S. Army" [October 8, 2008, EADS press release]. http://www.uh-72a.com/news-press-releases/2007/2007_10_08.asp.

"EADS North America Nears the 25-Delivery Milestone for its UH-72A Lakota Light Utility Helicopter" [April 2, 2008, EADS press release]. http://www.uh-72a.com/news-press-releases/2008/2008_04_02.asp.

"EADS North America Passes the Halfway Mark in Deliveries of the U.S. Army UH-72A Lakota Helicopter" [August 24, 2011, EADS press release]. http://www.uh-72a.com/news-press-releases/2011/2011_08_24.asp.

"EADS North America Ramps-Up its Production and Deliveries of the U.S. Army's UH-72A Lakota Light Utility Helicopter" [February 6, 2007, EADS press release]. http://www.uh-72a.com/news-press-releases/2007/2007_02_06.asp.

"EADS North America Receives $247 Million Contract for Light Utility Helicopter Program" [December 10, 2009, EADS press release]. http://www.uh-72a.com/news-press-releases/2009/2009_12_10.asp.

"EADS North America Receives a Second Production Order for U.S. Army UH-145 Light Utility Helicopters" [November 9, 2006, EADS press release]. http://www.uh-72a.com/news-press-releases/2006/2006_11_07.asp.

"EADS North America Receives Order for 39 Additional UH-72A Lakota Light Utility Helicopters" [December 8, 2008, EADS press release]. http://www.uh-72a.com/news-press-releases/2008/2008_12_08.asp.

"EADS North America Receives the First Phase of a $152 Million U.S. Army Contract to Equip UH-72A Lakotas for Security and Support Battalion Missions" [October 4, 2010, EADS press release]. http://www.uh-72a.com/news-press-releases/2010/2010_10_04.asp.

"EADS North America to Provide the U.S. Navy with UH-72 Lakota Light Utility Helicopters" [October 6, 2008, EADS press release]. http://www.uh-72a.com/news-press-releases/2008/2008_10_06.asp.

"EADS North America's UH-72A Lakota Helicopter Program Continues on-Time and on-Budget Deliveries" [February 9, 2011, EADS press release]. http://www.uh-72a.com/news-press-releases/2011/2011_02_09.asp.

"EADS North America's First Security and Support Battalion-Equipped Lakota Begins Operational Service" [November 5, 2011, EADS press release]. http://www.uh-72a.com/news-press-releases/2011/2011_11_05.asp.

"EADS to be Renamed Airbus Group." *BBC News* (July 31, 2013). http://www.bbc.co.uk/news/business-23513650.

Eslocker, Asa. "Army Will Spend Millions Fixing New Billion-Dollar Chopper." *ABC News* (November 27, 2007). http://abcnews.go.com/blogs/headlines/2007/11/army-will-spend/.

"Eurocopter EC145." Last modified November 9, 2014. Accessed November 20, 2014. http://en.wikipedia.org/wiki/EC145.

Eurocopter EC145 Technical Data. 2006: Eurocopter. http://www.aviation-broker.com/fileadmin/user_upload/flugzeuge/helikopter/eurocopter_EC_145/TD_EC145.pdf.

"Eurocopter UH-72 Lakota." 2010. Accessed February 22, 2010. http://en.wikipedia.org/wiki/Eurocopter_UH-72_Lakota.

"Eurocopter's EC145 Inlet Barrier Filter: Maximizing Performance while Minimizing Downtime." Accessed November 22, 2014. http://airbushelicoptersinc.com/images/products/ec145/ec145_inlet_barrier_filter.pdf.

"Expanding Missions for the UH-72A are Highlighted at the 100th Lakota Delivery Ceremony" [March 4, 2010, EADS feature story]. http://www.uh-72a.com/news-feature-story/2010/03–04–2010.asp.

Expert Glossary. Accessed November 20, 2014. http://www.expertglossary.com/definition/first-unit-equipped-date.

"Feature Creep (Requirements Creep or Scope Creep)" [Search CIO]. Accessed November 23, 2014. http://searchcio.techtarget.com/definition/feature-creep.

Federal Acquisition Regulation (FAR), (2014): 16.202. https://acquisition.gov/far/facframe.html.

"Federal Aviation Administration; Airworthiness Certificates Overview." Last modified August 9, 2011. Accessed November 22, 2014. http://www.faa.gov/aircraft/air_cert/airworthiness_certification/aw_overview/.

"The First MEDEVAC-Configured UH-72As are Delivered to the National Guard" [March 12, 2009, EADS feature story]. http://www.uh-72a.com/news-feature-story/2009/03–3-09-dc-guard-delivery-ceremony.asp.

"Flight Control Systems (FCS)." Accessed November 21, 2014. http://www.sagem.com/spip.php?rubrique233&lang=en.

"Flight Dynamics." Last modified August 18, 2014. Accessed November 21, 2014. http://en.wikipedia.org/wiki/Flight_dynamics.

"Fort Irwin National Training Center." Last modified November 21, 2014. Accessed November 22, 2014. http://en.wikipedia.org/wiki/Fort_Irwin_National_Training_Center.

"Fort Rucker." Last modified August 17, 2014. Accessed November 22, 2014. http://en.wikipedia.org/wiki/Fort_Rucker,_AL.

Freedberg, Sydney, Jr. 2014. "Budgets and 'Betrayal:' National Guard Fights to Keep Apache Gunships." *Breaking Defense* (January 23, 2014). http://breakingdefense.com/2014/01/budgets-betrayal-national-guard-fights-to-keep-apache-gunships/.

Gansler, Jacques, and William Lucyshyn. 2008. *Commercial Off-the-Shelf (COTS): Doing it Right*. College Park, Maryland: University of Maryland, School of Public Policy, Center for Public Policy and Private Enterprise. http://www.dtic.mil/dtic/tr/fulltext/u2/a494143.pdf.

Gore, Leada. 2013. "Mississippi Officials Rally to have Funding Restored for Lakota Helicopter Purchases" [Posted May 31, 2013]. http://www.al.com/business/index.ssf/2013/05/eads_mississippi_officials_ral.html.

Gourley, Scott. 2008. "UH-72A Lakota" [Article no longer available on original website; article may be obtained from http://www.highbeam.com/doc/1P3–1436762771.html]. *Army* (January 2008). http://findarticles.com/p/articles/mi_qa3723/is_200801/ai_n24394582/?tag=content;col1;http://www.highbeam.com/doc/1P3–1436762771.html.

———. 2010. "Rapid Response." *Defence Helicopter* 29 (March/April 2010): 15–18. http://www.wescam.com/wp-content/uploads/DH_MarApr10_p15–18.pdf.

"Guard Units Receive More High-Tech Lakota Helicopters." *Arnews* (July 10, 2008). http://www.army.mil/article/10788/guard-units-receive-more-high-tech-lakota-helicopters/.

Hankins, Daron. "Fielding the UH-72A Lakota" [Posting no longer available]. 2012. https://akologin.us.army.mil/suite.

Hemmerdinger, John. 2014a. "Airbus Helicopters Promotes Cost Savings of Lakota Trainer as Competitors Line Up." *Flightglobal* (May 2, 2014). http://www.flightglobal.com/news/articles/airbus-helicopters-promotes-cost-savings-of-lakota-trainer-as-competitors-line-398851/.

———. 2014b. "U.S. Army to Acquire 20 More Lakotas." *Flightglobal* (January 17, 2014). http://www.flightglobal.com/news/articles/us-army-to-acquire-20-more-lakotas-394994/.

Hoyle, Craig. 2014. "Thailand Requests Additional UH-72A Helicopters." *Flightglobal* (October 2, 2014). http://www.flightglobal.com/news/articles/thailand-requests-additional-uh-72a-helicopters-404385/.

Iacampo, Mark. 2011. "End of an Era: Last 'Huey' Helicopters in Active Service in Europe Retire." (May 2, 2011). http://www.army.mil/article/55815/.

"IGE, OGE and Recirculation." Accessed November 22, 2014. http://www.helis.com/howflies/igeoge.php.

Insinna, Valerie. 2013. "Army Not Impressed with Armed Aerial Scout Offerings." *National Defense* (April 30, 2013). http://www.nationaldefensemagazine.org/blog/Lists/Posts/Post.aspx?ID=1129.

"Instrument Flight Rules." Last modified July 28, 2014. Accessed November 21, 2014. http://en.wikipedia.org/wiki/Instrument_flight_rules.

Interagency Helicopter Operations Guide. 2013. Boise, ID: National Wildfire Coordinating Group. http://gacc.nifc.gov/sacc/logistics/aircraft/IHOG.pdf.

Interim DOD Instruction 5000.02, Operation of the Defense Acquisition System. (2013): 1. http://www.dtic.mil/whs/directives/corres/pdf/500002_interim.pdf.

Jesmain, Andrew. March 2009. *No. 7: Case Study—The Drivers of a Successful COTS Acquisition*. Washington, DC: Center for Strategic and International Studies. http://csis.org/files/media/csis/pubs/090313_diig_luh.pdf.

Kesner, Kenneth. 2012."Redstone Arsenal Home to Association of U.S. Army 2012 Civilian of Year." *The Huntsville Times* (September 16, 2012). http://blog.al.com/huntsville-times-business/2012/09/redstone_arsenal_home_to_assoc.html.

Krussow, David. 2009. "Two of a Kind." *Vertical* (August 24, 2012). http://www.verticalmag.com/features/features_article/21445-two-of-a-kind.html.

"A Lakota 'Family Photo' Underscores the Mission Diversity for EADS North America's UH-72A" [May 17, 2010, EADS feature story]. http://www.uh-72a.com/news-feature-story/2010/05–17–2010.asp.

"Lakota Variants Bring Enhanced Capabilities to U.S. Army Operations" [October 26, 2010, EADS feature story]. http://www.uh-72a.com/news-feature-story/2010/10–26–2010.asp.

LeBlanc, Aaron. 2011."Louisiana Guard to Fly New Helicopter in Overseas Mission" [August 5, 2011]. http://www.arng.army.mil/News/Pages/LouisianaArmyGuardFirsttoFlyNewHelicopterinOverseasMission.aspx.

"Light Utility Helicopter (LUH)." Last modified July 7, 2011. Accessed November 18, 2014. http://www.globalsecurity.org/military/systems/aircraft/luh.htm.

"Light Utility Helicopter (LUH)/UH-72A Lakota," in *Army Weapons System Handbook*. 2011. http://www.fas.org/man/DOD-101/sys/land/wsh2011/212.pdf.

"Lockheed Martin VH-71 Kestrel." Last modified October 31, 2014. Accessed November 23, 2014. http://en.wikipedia.org/wiki/Lockheed_Martin_VH-71_Kestrel.

Lopez, C. 2009."New UH-72A Lakota Helicopter of U.S [Sic] Army is Approaching 100,000 Flight Hours" [April 9, 2012]. http://www.airrecognition.com/index.php/focus-analysis-photo-report-aviation-defence-industry/aviation-defence-industry-technology/448-new-uh-72a-lakota-helicopter-of-us-army-is-approaching-100000-flight-hours-0904124.html.

"Louisiana National Guard Helicopters Get High-Tech Equipment." *Times-Picayune* (October 30, 2011). http://www.nola.com/military/index.ssf/2011/10/national_guard_helicopters_get.html.

"LUH - Eurocopter UH-72A Lakota." Accessed November 19, 2014. http://www.helis.com/programs/luh.php.

Malone, Rebekah. 2009. "LA. Guard's Helicopters Receive High-Tech Upgrades" [November 2, 2011]. http://geauxguard.com/la-guard%E2%80%99s-helicopters-receive-high-tech-upgrades/2934/.

The Market for Light Military Rotorcraft 2010–2019. 2010. Forecast International. http://www.forecastinternational.com/samples/F602_CompleteSample.pdf.

McCleary, Paul. 2013. "Hopes Fade for U.S. Army Aerial Scout." *Defense News* (December 5, 2013). http://www.defensenews.com/article/20131205/DEFREG02/312050025/.

McCleary, Paul, and Michelle Tan. 2013. "Army Plans to Scrap Kiowa Helo Fleet." (December 9, 2013). http://www.marinecorpstimes.com/article/20131209/NEWS04/312090006/.

McCleary, Paul, and Marcus Weisgerber. 2014. “U.S. Army Seeks to Purchase 100 Lakota Helicopters.” *Defense News* (February 27, 2014). http://www.defensenews.com/article/20140227/DEFREG02/302270027/U.S.-Army-Seeks-Purchase-100-Lakota-Helicopters.

McHale, John. 2011a. “Army Looks to Helicopter Avionics Upgrades and Technology Insertion in the Absence of New Rotorcraft Programs.” *Military & Aerospace Electronics* (January 21, 2011). http://www.militaryaerospace.com/articles/2011/01/army-looks-to-helicopter.html.

———. 2011b. “UH-72A Lakotas Continue to be Delivered on Time, Freeing up Black Hawks for Combat” [April 20, 2011]. http://www.uh-72a.com/news-external-news/2011/4–20–2011-Aerospace.asp.

McQueary, Charles. 2007a. *Director Operational Test and Evaluation FY 2007 Report*. http://www.dote.osd.mil/pub/reports/FY2007/.

———. 2007b. *UH-72A Lakota Light Utility Helicopter (LUH) Operational Test and Evaluation Report*. July 2007. http://hosted.ap.org/specials/interactives/_documents/lakota_report.pdf.

———. 2008. *Director Operational Test and Evaluation, FY 2008 Report*. http://www.dote.osd.mil/pub/reports/FY2008/pdf/army/2008luh.pdf.

Mehta, Aaron. 2013. “EADS Cleared to Sell Lakota to Thailand.” *Defense News* (June 21, 2013). http://www.defensenews.com/article/20130621/DEFREG03/306210016/EADS-Cleared-Sell-Lakota-Thailand.

Military Definitions. Accessed November 22, 2014. https://www.fas.org/news/reference/lexicon/deo.htm.

Miller, Alan. 2013. “Army Aviation Unit in Grand Ledge gets Helicopter Upgrade” [No longer available]. (June 5, 2013). http://www.lansingstatejournal.com/.

“Mine Resistant Ambush Protected (MRAP) Vehicle Program.” Last modified January 10, 2012. Accessed November 23, 2014. http://www.globalsecurity.org/military/systems/ground/mrap.htm.

Modernizing the Army’s Rotary Wing Aviation Fleet. 2007. Congressional Budget Office. http://www.cbo.gov/sites/default/files/11–30-helicopters.pdf.

Mokhtari, Megan. 2013. “Contracting Interns Receive Aviation Overview.” *The Redstone Rocket* (February 20, 2103).

http://www.theredstonerocket.com/military_scene/article_b14943e2–7b70–11e2-a142–001a4bcf887a.html.

"MX-15" [Wescam's (manufacturer) website]. July 2012. http://www.wescam.com/wp-content/uploads/PDS-MX-15–63133K-July-2012.pdf.

"Naamloze Vennootschap." Last modified October 13, 2014. Accessed November 21, 2014. http://en.wikipedia.org/wiki/Naamloze_vennootschap.

National Defense Authorization Act for Fiscal Year 2012: Report of the Committee on Armed Services - House of Representatives on HR 1540 [May 17, 2011, 22]. Report 112–78: Division A—Department of Defense Authorizations; Title I, Procurement. http://www.gpo.gov/fdsys/pkg/CRPT-112hrpt78/pdf/CRPT-112hrpt78.pdf.

Nelms, Douglas. 2009. "Living with Lakota" [article no longer available online]. Article referenced on http://connection.Ebscohost.Com.Libproxy.Nps.edu/c/articles/45725729/living-Lakota. [Article also published with title, "Guard Moves to UH-72A Lakota for Medevac" (Same date, same publication)]. *Aviation Week & Space Technology* (November 16, 2009). November 20, 2009. http://www.aviationweek.com/aw/jsp_includes/articlePrint.jsp?storyID=news/UH72–2-111309.xml&headLine=Guard%20Moves%20To%20UH-72A%20Lakota%20For%20Medevac.

———. 2012a. "Flying the Brass." *Rotor & Wing* (April 2012). http://www.aviationtoday.com/rw/military/utility/Army-12th-Flying-the-Brass_76116.html.

———. 2012b. "Program Insider: EADS 200th UH-72A." *Rotor & Wing* (May 1, 2012). http://www.aviationtoday.com/rw/military/observation/Program-Insider-EADS-200th-UH-72A_76245.html.

———. 2013. "EADS Targets U.S. Air Force as Next UH-72 Lakota Customer." *Rotor & Wing* (December 1, 2013). http://www.aviationtoday.com/rw/topstories/EADS-Targets-U-S-Air-Force-As-Next-UH-72-Lakota-Customer_80685.html.

"New Army Chopper found Unsafe" [Posted November 10, 2007]. http://www.military.com/NewsContent/0,13319,155898,00.html.

Oestergaard III, Joakim K. 2014. "UH-72 Lakota." Last modified June 6, 2014. http://www.bga-aeroweb.com/Defense/UH-72-Lakota-LUH.html.

"OH-58A Kiowa." Accessed November 23, 2014. http://www.helis.com/database/model/2/.

"Old Habits are Hard to Break." *Knowledge: Official Safety Magazine of the U.S. Army* (September 2008): 21. http://www.sec.army.mil/114/sep08/knowledge_september_2008.pdf.

"On a Turbine Powered Airplane, what does the n1 and n2 on the Instrument Panel Mean?" Accessed November 21, 2014. https://answers.yahoo.com/question/index?qid=20081108213940AAdfb0z.

Operator's Manual for Multiple Integrated Laser Engagement System (MILES) Simulator System, Firing Laser: M79 AH-1S Attack Helicopter Weapon System NSN 1270–01–159–0481." October 1984: Headquarters, Department of the Army. http://books.google.com/books?id=bzQYAAAAYAAJ&pg=PP3&lpg=PP3&dq=Headquarters,+Department+of+the+Army,+TM+9–1270–224–10&source=bl&ots=HsKruPTqpV&sig=zuoozmhHDqp4KsWeRLqwFjko8C8&hl=en&sa=X&ei=wZQPVL7JCvKTsQSexIHoBw&ved=0CCQQ6AEwAQ#v=onepage&q=Headquarters%2C%20Department%20of%20the%20Army%2C%20TM%209–1270–224–10&f=false.

Orrell, Jonathan. 2012. "Maryland Army Guard Unveils Newest Helicopter in its Arsenal." *U.S. Army Homepage* (April 30, 2012). http://www.army.mil/article/78737/Maryland_Army_Guard_unveils_newest_helicopter_in_its_arsenal/.

Osborn, Kris. 2011. "Army's New Lakota Packed with High-Tech Gear." *Army News Service* (April 26, 2011). http://www.army.mil/article/55515.

Parsons, Dan. 2012. "Scout Helicopter Competitors to Army: It's Time for a Flyoff." *National Defense* (December, 2012). http://www.nationaldefensemagazine.org/archive/2012/December/Pages/ScoutHelicopterCompetitorstoArmyIt%E2%80%99sTimeforaFlyoff.aspx.

Posture of the United States Army 2014.113th Congress, Second Session. April 3, 2014. http://www.armed-services.senate.gov/imo/media/doc/McHugh-Odierno_04–03–14.pdf.

"Production Team: Overview" [Page of Airbus Group's "UH-72A" website]. Accessed November 22, 2014. http://www.uh-72a.com/team/overview.asp.

"Production Team: Suppliers" [Page on Airbus Group's website]. Accessed November 22, 2014. http://www.uh-72a.com/team/suppliers.asp.

"Photo Gallery" [Airbus Group's webpage]. Accessed November 21, 2014. http://www.uh-72a.com/resources/photo-gallery.asp.

[Photograph of UH-72A with External Hoist Deployed, no title, no date]. Accessed November 21, 2014. http://media.defenceindustrydaily.com/images/AIR_EC145_Rescue_Hoisting_lg.jpg.

[Photograph of UH-72A, no title, no date]. Accessed November 21, 2014. http://www.globalsecurity.org/jhtml/jframe.html#http://www.globalsecurity.org/military/systems/aircraft/images/uh-72-a_army-mil-2006–12–13–142838.jpg||.

"Production Certificate." Last modified May 3, 2007. http://www.faa.gov/aircraft/air_cert/production_approvals/prod_cert/.

"Request for Proposal (Draft) W58RGZ-05-R-0004" [Posted on FedBizOpps October 25, 2004; archived February 8, 2005]. http://www.fbodaily.com/archive/2004/10-October/27-Oct-2004/FBO-00698720.htm.

"Request for Proposal (RFP) W58RGZ-05-R-0519" [Posted on FedBizOpps July 1, 2005; archived July 15, 2006]. https://www.fbo.gov/index?s=opportunity&mode=form&tab=core&id=fd90974812b0789698966bc541d7f6f2.

Robinson, Skip. 2012. "Being the Enemy." *Vertical* (April 25, 2012). http://www.verticalmag.com/features/features_article/20382-being-the-enemy.html.

———. 2013. Improving Security and Support." *Vertical* (July 15, 2013). http://www.verticalmag.com/news/article/Improving-Security-and-Support#.UegTC9LbOy7.

"Rotorcraft Report." *Rotor & Wing* (January 1, 2007). http://www.aviationtoday.com/rw/Rotorcraft-Report_7571.html.

Rowlett, Russ. 2005. "How Many? A Dictionary of Units of Measurement." [July 11, 2005]. http://www.unc.edu/~rowlett/units/.

Schwartz, Moshe. 2014. *Defense Acquisitions: How DOD Acquires Weapon Systems and Recent Efforts to Reform the Process.* Congressional Research Service. (May 23, 2014). http://fas.org/sgp/crs/natsec/RL34026.pdf.

"Scope Creep." Last modified July 31, 2014. Accessed November 23, 2014. http://en.wikipedia.org/wiki/Scope_creep.

"Scope Creep" [TheFreeDictionary]. Accessed November 23, 2014. http://encyclopedia2.thefreedictionary.com/Requirements+creep.

Selected Acquisition Report (SAR) Summary Tables as of December 31, 2006. 2007. Department of Defense OUSD (AT&L) ARA/AM. http://www.acq.osd.mil/ara/am/sar/2006-DEC-SST.pdf.

Selected Acquisition Report (SAR) Summary Tables as of September 30, 2008. 2008. Department of Defense OUSD (AT&L) ARA/AM. http://www.acq.osd.mil/ara/am/sar/2008-SEP-SARSUMTAB.pdf.

Selected Acquisition Report (SAR) Summary Tables as of December 31, 2009. 2010. OUSD (AT&L) ARA/AM. http://www.acq.osd.mil/ara/am/sar/SST-2009–12–31.pdf.

Selected Acquisition Report (SAR) Summary Tables as of September 30, 2010. 2010. Department of Defense OUSD (AT&L) ARA/AM. http://www.acq.osd.mil/ara/am/sar/30Sep10Tables.pdf.

Selected Action Report (SAR) LUH as of December 31, 2010. Defense Acquisition Management Information Retrieval (DAMIR). http://www.DOD.mil/pubs/foi/logistics_material_readiness/acq_bud_fin/SARs/DEC_2010_SAR/LUH-SAR-25_DEC_2010.pdf.

Selected Action Report (SAR) LUH as of December 31, 2011. 2012. Defense Acquisition Management Information Retrieval (DAMIR). http://www.DOD.mil/pubs/foi/logistics_material_readiness/acq_bud_fin/SARs/DEC_2011_SAR/LUH-SAR_31_DEC_2011.pdf.

Selected Action Report (SAR) LUH as of December 31, 2012. 2013. Defense Acquisition Management Information Retrieval (DAMIR). http://www.DOD.mil/pubs/foi/logistics_material_readiness/acq_bud_fin/SARs/2012-sars/13-F-0884_SARs_as_of_Dec_2012/Army/LUH_December_2012_SAR.pdf.

Shalal-Esa, Andrea. "Exclusive: U.S. Army Officials Said to Back New Scout Helicopter." *Thomson Reuters* (November 30, 2012). http://www.reuters.com/article/2012/12/01/us-army-helicopter-idUSBRE8B002T20121201?feedType=RSS&feedName=everything&virtualBrandChannel=11563 .

"Sikorsky UH-60 Black Hawk." Last modified November 21, 2014. Accessed November 22, 2014. http://en.wikipedia.org/wiki/UH-60_Black_Hawk.

"Sikorsky UH-60 Blackhawk." Accessed November 22, 2014. http://www.bga-aeroweb.com/Defense/UH-60-Black-Hawk.html.

"Sikorsky UH-60 Blackhawk." Accessed November 22, 2014. http://www.combataircraft.com/en/Military-Aircraft/Sikorsky/UH-60-Blackhawk/.

"SMODIM—Smart Onboard Data Interface Module." Accessed November 22, 2014. http://www.inter-coastal.net/smodim.html.

Soucy, John. "New Helicopters Delivered to District of Columbia National Guard." *National Guard Bureau News* (March 12, 2009). http://www.arng.army.mil/News/Pages/NewHelicoptersDeliveredtoDistrictofColumbiaNationalGuard.aspx.

"Sources Sought Notice for LUHs" [Posted on FedBizOpps May 3, 2005; archived July 15, 2006]. https://www.fbo.gov/index?s=opportunity&mode=form&tab=core&id=3469d4b2067cda7d295a8c22c14d924c&_cview=0.

Squatrito-Martin, Betty. (2009). "Lakota UH-72A MEP Upgrade Underway." http://ngbcounterdrug.ng.mil/News/Pages/LakotaMEPUpgradeUnderway.aspx.

"Tactical Engagement Simulation." Last modified April 5, 2014. Accessed November 21, 2014. http://en.wikipedia.org/wiki/Tactical_engagement_simulation.

Technical Manual (TM) 1–1500–204–23–1, General Aircraft Maintenance (General Maintenances and Practices), Vol. 1, 1992. [Technical manual]. Headquarters, Department of the Army. http://safety.korea.army.mil/Toolbox/Resources/Publications/TM1–1500–204–23–1.pdf.

Tegler, Jan. "Light Utility Helicopter: UH-72A Lakota Introduction Progresses Rapidly." *Defense Media Network* (December 31, 2009). http://theyearindefense.com/aerospace/light-utility-helicopter-uh-72a-lakota-introduction-progresses-rapidly.

"Thai Army to Get UH-72A Lakotas." *Airheads↑fly* (April 2, 2014). http://airheadsfly.com/2014/04/02/thai-army-to-get-uh-72a-lakotas/.

"Thailand to Buy Six UH-72A Lakota Helicopters." *Defenseworld* (April 1, 2014). http://www.defenseworld.net/news/10316/Thailand_To_Buy_Six_UH_72A_Lakota_Helicopters.

"Thailand–UH-72A Lakota Helicopters" [June 20, 2013 Defense Security Cooperation Agency news release]. http://www.dsca.mil/major-arms-sales/thailand-uh-72a-lakota-helicopters.

Thurgood, Neil, and David Bristol. 2010a. "Army's Newest Helicopter Blends Aviation Traditions with Innovation." *Army AL&T Magazine* (October–December 2010). http://asc.army.mil/docs/pubs/alt/archives/2010/Oct-Dec_2010.pdf.

———. 2010b. "UH-72A Lakota—A Key Component of Army Aviation Modernization." *Army AL&T* (April–June 2010). http://asc.army.mil/docs/pubs/alt/2010/2_AprMayJun/articles/33_UH-72A_Lakota--A_Key_Component_of_Army_Aviation_Modernization_201002.pdf.

Thurgood, Neil, and John Burke. 2010. "Commercial-off-the-Shelf (COTS): A Success Story." *Aviation Today*. (July 1, 2010). http://www.aviationtoday.com/regions/usa/Commercial-off-the-Shelf-COTS-A-Success-Story_68854.html.

Thurgood, Neil, and Gregory Gore. "Utility Helicopters Update" [PowerPoint Presentation presented at 2011 Annual Forum of Army Aviation Association of America (AAAA)]. http://www.quad-a.org/images/pdf/Presentations/AnnualForum/2011/alpha/8-Thurgood%20Quad_A%20Presentation%2004062011.pdf.

Tiron, Roxana. "Army Defends Light Chopper Amid Warnings it Could Fail" [Article no longer available]. *The Hill* (November 20, 2007). July 1, 2009. http://thehill.com/business-a-lobbying/3382-army-defends-light-chopper-amid-warnings-it-could-fail.

Tomkins, Richard. 2014a. "Thailand Requests FMS Sale of Lakota Helicopters" [Posted on Business News' website]. *United Press International* (September 30, 2014). http://www.upi.com/Business_News/Security-Industry/2014/09/30/Thailand-requests-FMS-sale-of-Lakota-helicopters/2661412092767/.

———. 2014b. "U.S. Army Receives 300th UH-72A Lakota from Airbus Group Inc." *United Press International* (May 15, 2014). Accessed November 22, 2014. http://www.upi.com/Business_News/Security-Industry/2014/05/15/U.S.-Army-receives-300th-UH-72A-Lakota-from-Airbus-Group-Inc/3101400166822/.

Tracey, Sara. "LATHAM: Copters an Upgrade for Guard" [Article no longer available]. *Daily Gazette* (Schenectady, NY*)* (March 7, 2012). http://www.dailygazette.net/standard/ShowStoryTemplate.asp?Path=SCH/2012/07/03&ID=Ar00103&Section=National.

Type Classification, Materiel Release, Fielding, and Transfer, Public Law 700–142, (2013): 4–5. http://armypubs.army.mil/epubs/pdf/r700_142.pdf.

"U.S. Army Places $83-Million Order for 17 Lakotas." *Vertical* (October 23, 2014). http://www.verticalmag.com/news/article/USArmyplaces83millionorderfor17Lakotas.

"The U.S. Army Showcases its UH-72A Lakota to the World" [September 21, 2010, EADS feature story]. http://www.uh-72a.com/news-feature-story/2010/09–21–2010.asp.

"U.S. Army UH-72A Lakota Receives Full-Rate Production Authorization" [September 4, 2007, EADS press release]. http://www.uh-72a.com/news-press-releases/2007/2007_09_04.asp.

"UH-1 Iroquois (Huey)." Last modified July 7, 2011. Accessed November 22, 2014. http://www.globalsecurity.org/military/systems/aircraft/uh-1-specs.htm.

"UH-1H Huey." Accessed November 22, 2014. http://www.olympicflightmuseum.com/collection-UH1HHuey.php.

UH-1H Huey Flight Manual. May 19, 2013. Bell Helicopter. http://www.digitalcombatsimulator.com/en/files/346897/.

"UH-1H Iroquois." Accessed November 22, 2014. http://www.helis.com/database/model/446/.

"UH-60 Black Hawk." Last modified April 23, 2000. Accessed November 22, 2014. http://fas.org/man/DOD-101/sys/ac/uh-60.htm#black.

"UH-60 Blackhawk." Accessed November 22, 2014. http://www.flugzeuginfo.net/acdata_php/acdata_s70_en.php.

"UH-60L Black Hawk." Last modified July 7, 2011. Accessed November 22, 2014. http://www.globalsecurity.org/military/systems/aircraft/uh-60l-specs.htm.

"UH-60L Blackhawk." Accessed November 22, 2014. http://www.helis.com/database/model/532/.

"UH-60M Black Hawk Helicopter." Accessed November 22, 2014. http://www.sikorsky.com/Products/Product+Details/Model+Family+Details/Model+Details?provcmid=bfa955f4a9d98110VgnVCM1000001382000aRCRD&mofvcmid=57aaebb600e98110VgnVCM1000001382000aRCRD&mofid=47aaebb600e98110VgnVCM1000001382000a____&movcmid=609669(TRUNCATED) .

"UH-72A Lakota." Accessed November 20, 2014. http://www.military-today.com/helicopters/uh72a_lakota.htm.

"The UH-72A 'comes Home' to its New Army Assignment in Mississippi" [June 7, 2008, EADS feature story]. http://www.uh-72a.com/news-feature-story/2008/2008_06_7.asp.

"UH-72A Factsheet." *Airbus Helicopters*. Accessed November 20, 2014. http://airbushelicoptersinc.com/images/products/UH-72a/UH72A-factsheet.pdf.

"UH-72A Lakota." *Stand-to!* (August 5, 2011). http://www.army.mil/standto/archive/issue.php?issue=2011–08–05.

"UH-72 Lakota Light Helicopter Lands Airbus in US Defense Market." (August 26, 2014). http://tacticalmashup.com/uh-72-lakota-light-helicopter-lands-airbus-in-us-defense-market/

"UH-72A Lakota on European Ground." *Dutch Aviation Support/Dutch Aviation Media BV*. Accessed November 20, 2014. http://www.dutchaviationsupport.eu/Articles/LAKOTA-UK.pdf.

"UH-72A Lakota Light Utility Helicopter." Accessed November 20, 2014. http://www.airrecognition.com/index.php?option=com_content&task=view&id=414.

"UH-72A Lakota Light Utility Helicopter (LUH)." Last modified July 12, 2014. Accessed November 18, 2014. http://www.globalsecurity.org/military/systems/aircraft/uh-72.htm.

"UH-72A Lakota Light Utility Helicopter, United States of America." Accessed November 20, 2014. http://www.army-technology.com/projects/uh-72a-lakota/.

"The UH-72A Lakota Makes First Flight with U.S. Army Security and Support Battalion Mission Equipment Package" [August 12, 2010, EADS press release]. http://www.uh-72a.com/news-press-releases/2010/2010_08_12.asp.

"The UH-72A Light Utility Helicopter Enters Operational Service with the First Fully-Equipped U.S. Army Unit" [June 19, 2007, EADS press release]. http://www.uh-72a.com/news-press-releases/2007/2007_06_19.asp.

"UH-72A Limits." Accessed November 21, 2014. http://quizlet.com/5398187/uh-72a-limits-flash-cards/.

"The UH-72A Program: On Time, on Cost, and Supporting the U.S. Army and America's Industrial Base" [April 21, 2011, EADS feature story]. http://www.uh-72a.com/news-feature-story/2011/4–21–2011.asp.

"UH-72A Specifications." Accessed November 20, 2014. http://www.eurocopterusa.com/products/UH-72A-specifications.asp.

United States Government Accountability Office (GAO) Decision B-298502; B-298502–2; B-298502–3; B-298502–4; B-298502–5; MD Helicopters, Inc.; Augusta-Westland, Inc. (October 23, 2006). http://www.gao.gov/decisions/bidpro/298502.pdf.

"USA.Com: Fort Irwin, CA Weather." Accessed November 22, 2014. http://www.usa.com/fort-irwin-ca-weather.htm#HistoricalTemperature.

"Visual Flight Rules." Last modified November 13, 2014. Accessed November 21, 2014 https://en.wikipedia.org/wiki/Visual_flight_rules.

"W58RGZ-09-R-0129, Sources sought for Armed Reconnaissance Helicopter" [Posted November 7, 2008; archived February 2, 2009]. https://www.fbo.gov/index?s=opportunity&mode=form&tab=core&id=368c3aa49b10dfafbb56509eb44c3013.

"W58RGZ-10-R-0175, Armed Aerial Scout Request for Information" [Posted January 26, 2010; archived May 17, 2010]. https://www.fbo.gov/?s=opportunity&mode=form&id=13007f022739dac094e0b52a9e19683d&tab=core&_cview=0.

Warwick, Graham. "U.S. Army Confirms AAS Will be New Start or OH-58 SLEP." *Aviation Week* (May 10, 2013). http://aviationweek.com/defense/us-army-aas-will-be-new-start-or-oh-58-slep.

Weapons Acquisition Reform: Reform Act is Helping DOD Acquisition Programs Reduce Risk, but Implementation Challenges Remain. 2012. December 14, 2012. Government Accountability Office. http://www.gao.gov/products/GAO-13–103.

"Weather for You: Dale County, Alabama." Accessed November 22, 2014. http://www.weatherforyou.com/reports/index.php?forecast=pass&pass=normals&zipcode=&place=dale+county&state=al&country=us&hwvRMon=Feb.

Webster's New World Dictionary. 1988. Third College Edition. New York: Simon & Schuster.

Weisberger, Marcus. "Airbus: U.S. Army's Extra Lakota Helicopter Buy Boosts Foreign Sale Potential." *Defense News* (May 1, 2014). http://www.defensenews.com/article/20140501/DEFREG02/305010022/Airbus-U.S.-Army-s-Extra-Lakota-Helicopter-Buy-Boosts-Foreign-Sale-Potential.

"What is 'Rotor Wash?'" Accessed November 21, 2014. https://answers.yahoo.com/question/index?qid=20081204235458AApJtuS.

"Wide Area Augmentation System." Last modified October 15, 2014. Accessed November 22, 2014. http://en.wikipedia.org/wiki/Wide_Area_Augmentation_System.

"Wire Strike Protection System." Last modified November 17, 2014. Accessed November 22, 2014. http://en.wikipedia.org/wiki/Wire_Strike_Protection_System.

Wong, Amy. "Definition: Soft Keyboard (Onscreen Keyboard or Software Keyboard)." Last modified March 2011. Accessed November 21, 2014. http://whatis.techtarget.com/definition/soft-keyboard-onscreen-keyboard-or-software-keyboard.

Wood, Rick. "Huey Takes Last Historic Ride at Yakima Training Center." (February 3, 2011). http://www.army.mil/article/51344/huey-takes-historic-last-ride-at-yakima-training-center.

Wright, Austin. "U.S. Helicopter Suppliers Fear Losing Innovation War." *National Defense* (April 1, 2010). Accessed November 23, 2014. http://www.nationaldefensemagazine.org/archive/2010/April/Pages/USHelicopterSuppliersFearLosingInnovationWar.aspx.

THIS PAGE INTENTIONALLY LEFT BLANK

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center
   Ft. Belvoir, Virginia

2. Dudley Knox Library
   Naval Postgraduate School
   Monterey, California